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Readiness to Serve

PERHAPS no other set of men belonging to any industry, profession or calling realize more definitely than do the men of the electrical industry the meaning of "readiness to serve."

In every branch of electrical work men are acquainted with emergencies which call for quick thinking, subjection to discipline of both mind and body, courage and endurance. They are of the stuff from which good soldiers are made. So it is appropriate, when upon the horizon of our national life there appears a war cloud lowering that these men of our industry have been among the first and most acceptable to offer their service to the President. Among those who have recently served for border duty and among those now stationed there, are many men who in more peaceful times are prominently identified with the industry.

Now, when the greater and graver danger impends, we find electrical men, with all other allied and kindred engineering fraternities, employer, executive and employee alike, soberly and sincerely holding out their hands and bracing their shoulders in support of the administration.

Proper Margin of Generating Capacity a Public Benefit

AT a recent hearing before the Massachusetts Gas and Electric Light Commission on fairness of the Boston Edison Company's rates for city lighting, an expert called by the city of Boston testified that he regarded 10 per cent of generating capacity over and above the highest peak for the year as a safe working margin for central stations. Instances were cited where companies had operated with less reserve and had not suffered any embarrassment thereby. The purport of the testimony was to show that the Boston Edison Company had one or more large generators—15,000-kilowatt machines—more than it really needed, and hence the city was being charged for investment that was actually not needed in connection with the service it was receiving.

The question of what constitutes a safe working margin to provide against breakdown at the station is of course largely one for the exercise of judgment. There may be data which would serve as a basis for reckoning, but this must necessarily be more or less unreliable, past experience being no sure guarantee of what the future may have in store. The momentary disabling of a single large unit in a station may seriously affect the whole proposition, as affecting that particular plant. As generating units become larger and reliance is had more and more on single big turbines and less on a number of engine-driven dynamos, other things being equal, a wider margin should be provided. The concentration of generating equipment in one station, that was previously scattered among several stations, points to the same object, the fire risk and other contingencies being increased with the lower diversity-factor.

Now from both the company and the public standpoint, it is obvious that absolute dependability of service is exceedingly desirable. With some industries continuity of electricity supply is vitally essential. Short suspensions of power supply may easily entail grievous losses. With lighting the same may be true.

From the company's standpoint, a serious break in continuity of service is almost a calamity. It impairs the central station's reputation, to say nothing of harrowing up the sensibilities of the officials and men who are responsible for giving the community its light and power at all times they are required. We believe station operators, and heads of generating departments too, are better able to perform their duties if they are "dead sure" there is ample machinery behind the system to turn out the energy that may be called for at any and all times.

The small added charge falling on the community because of ample provision against service interruption is something which we believe the customers are usually entirely willing to carry. At most, such a charge is almost neglible. Just as passengers on a railway train would rather pay 2.5 cents a mile and be sure to reach their destination than pay 2.49 cents and ride behind a locomotive that is barely able to haul the train over the grades, so the customers of central stations are willing to pay for the security that uninterrupted service from an electric company affords their business, domestic and civic affairs.

The Future of the Electric Vehicle

LAST week Chicago's seventeenth automobile show closed. There were 400 cars exhibited at prices ranging from $395 to $11,000. There were 92 different makes of gasoline cars and five electrics.

It was 21 years ago that the American automobile industry was given its first substantial impetus for on that date the first "horseless carriage" contest was held in Chicago. Ninety cars were entered in the road con-

test of 90.74 miles, only two actually started, however, and but one of these finished. The winner was a 3.5-horsepower belt-driven three-speed contrivance that required 8 hours and 45 minutes to accomplish the run, and consumed 5.5 gallons of gasoline in doing so.

That was nearly a quarter of a century ago. Today it is estimated that there are more than 3,500,000 cars in use in this country. According to the Automobile Chamber of Commerce 1,617,708 cars were produced in America last year, being an increase over the previous year of about 80 per cent. Of these, 78,200 were exported, leaving for utilization in this country 1,539,508. Based upon the retail selling price the value of these cars was $1,088,028,273, of which $921,378,000 was for passenger cars and $166,650,273 for trucks. The average selling price for passenger cars was $605, that for trucks $1,809.

These figures are, in themselves, almost staggering as representing the vast number of mechanically propelled vehicles in use, the enormous sums of money invested in the business of manufacturing, selling and operating them, and as forcibly exemplifying the rapid and unprecedented strides and growth that the automobile industry has made in the brief span of 21 years. Yet this is only the beginning. It has been estimated that when the condition of roads permit, 12,000,000 mechanically operated vehicles can be profitably used in this country alone for passenger and freight haulage. At present road building is far behind automobile building, yet notwithstanding automobiles are being turned out at the rate of about one and one-half million per annum.

Interesting as are these statistics for their vastness, they mean more than mere figures to anyone interested in the development of the electric vehicle and the future of the central-station industry. What share of this colossal trade is the electric vehicle going to absorb, what proportion can it conquer from the gasoline vehicle, this year, next year, and in the years to come? When the European war is over, and this country's automobile manufacturing facilities with their enormous, magnificently equipped and efficiently organized productive plants ably supported by co-operative advertising agencies are free to concentrate their efforts in swamping competition by the electric by marketing gasoline vehicles at a price which covers only overhead charges, what can the electric vehicle do then?

The industry of the gasoline automobile is young, that of the electric still younger. The growth of the former has been phenomenal, that of the latter may be expected to be at least sure and steady. Those who know the possibilities of the electric vehicle rest assured that it will come into its own. We had always thought that the field of the electric and gasoline vehicle, whether for freight or passenger service but particularly the former, did not overlap, that each had quite a definitely prescribed field for eminently successful application. We believed the sphere of the gasoline vehicle began where that of the electric ended. Now we are finding that while the gasoline car cannot compete economically with the electric in the latter's domain the electric is on the other hand surely encroaching upon the field the gasoline vehicle supposedly held supreme, namely the higher speeds over much longer distances.

After all, the criterion is economy, and eventually this factor must be the deciding one. Gasoline trucks, many of them, are being sold today for applications for which they are not best suited, but they are being sold by salesmen who know, as the purchaser also knows, that the electric vehicle is preferable, yet they are being sold because immediate delivery is required and immediate delivery of the electric cannot be obtained. Thus the gasoline truck is in many instances signing its own death warrant, intentionally but unavoidably. There is urgent need for more electrics in use and available for use. The electric vehicle is severely handicapped, it is true, since it must meet competition from an industry already well founded and possessing an almost perfectly organized productive system where standardization has reached a high state of attainment and where obtain low productive costs such as are only possible where vast quantities are produced. Nevertheless more electrics are needed—and now.

Undoubtedly the greatest deterrent to the more universal use of the commercial electric vehicle is the lack of a universal battery-exchange system, which includes more judiciously located charging stations. And perhaps the greatest deterrent to the inauguration of some such arrangement—admittedly a very difficult one—is the limited number of electrics in use at the present time. Thus it is seen that the absence of proper battery charging and exchange facilities is at once the cause and the consequence of the limited number of electric vehicles in use today. The remedy lies with the electric-vehicle manufacturers, and central-station companies in the main. It probably means that "service" as well as energy will become of greater importance in much the same way that ornamental street lighting is frequently paid for upon a basis of energy consumed plus a charge per lamp or post for maintenance. That this may be possible requires conscientious and close concerted co-operation upon a line of action formulated from our faith in the future of the electric-vehicle situation rather than upon its status quo as it actually exists today.

The champions of the electric vehicle have a very hard task before them, for they are competing against great odds. When the electric-vehicle industry has overcome the hindrances due itself, which is no small task, there then remains the competition of the gasoline vehicle. The task before us is not an easy one, nor one which can be satisfactorily concluded without much effort for a long time to come. But we have the encouragement of our convictions, and never was time more opportune than now to advance them. We must formulate our plans deliberately and wisely with that foresight that the electrical industry has shown in the past, and then work together efficiently, enthusiastically, strenuously and untiringly.

HAPPENINGS IN THE INDUSTRY

American Institute Mid-Winter Program—W. W. Freeman Discusses Public Utility Relations—Power Requirements of the Electrochemical Industry—Iowa Electrical Contractors' Convention—Pole Statistics for 1915—Brooklyn Edison Dinner—Electrical Exports Establish New Record—New York Jobbers' Meeting—Miscellaneous News Notes

PROGRAM FOR AMERICAN INSTITUTE MEETING.

Many Interesting Topics to Be Considered at Mid-Winter Convention, New York, February 14 to 16.

The fifth mid-winter convention of the American Institute of Electrical Engineers will be held in the Engineering Societies Building, New York, N. Y., February 14 to 16. There will be five technical sessions, one each morning and on Wednedays and Friday afternoons. Thursday evening there will be a lecture under the auspices of the Electrophysics Committee. Wednesday evening and Thursday afternoon will be devoted to social features, inspection trips and other entertainment.

The technical program includes a diversity of subjects which will insure wide interest. The convention will open with an address by H. W. Buck, president of the Institute, and will be followed by a paper entitled "Internal Temperatures of Alternating-Current Generators," by Ralph Kelly. Two papers will be presented at the afternoon session, which is under the auspices of the Protective Devices Committee. These papers are "Reactors in Hydroelectric Stations," by J. A. Johnson, and "Protection of Transformer Neutrals Against Destructive Transient Disturbances," by Max H. Collbohm. Three papers will be presented on Thursday morning as follows: "Corona and Rectification in Hydrogen," by J. W. Davis and C. S. Breese; "The Electric Strength of Air—VII," by J. B. Whitehead and W. S. Brown; and "Oscillating Current Circuits by the Method of Generalized Angular Velocities," by V. Bush.

On Thursday evening there will be a lecture by Prof. R. A. Millikan on the subject of "Modern Physics."

The session on Friday morning will be under the auspices of the Industrial and Domestic Power Committee and there will be a paper entitled "Industrial Controllers With Particular Reference to the Control of Direct-Current Motors," by H. D. James, and a paper entitled "Analysis of Starting Characteristics of Direct-Current Motors," by K. L. Hansen.

At the final session on Friday afternoon there will be a paper entitled, "Transient Conditions in Asychronous Induction Machines and Their Relation to Control," by R. E. Hellmund and a paper entitled, "Performance of Polyphase Induction Motors Under Unbalanced Secondary Conditions," by A. A. Gazda.

THE RELATION OF PUBLIC UTILITIES TO THE PUBLIC.

Address by W. W. Freeman, of Cincinnati, Before Meeting of Electrical Engineers in Chicago.

A joint meeting of the Chicago Section of the American Institute of Electrical Engineers and the Electrical Section of the Western Society of Engineers was held in Chicago on the evening of January 31, when W. W. Freeman, president of the Union Gas & Electric Company, Cincinnati, O., made an address on "The Relation of Public Utilities to the Public." Mr. Freeman said that while it was not so difficult to define what should be the ideal relation between these interests, it was much more difficult to carry this out, due to frequent misunderstandings. The obligation on the utilities is to render the best possible service at reasonable rates and, on the other hand, on the restrictions that would hamper the rendering of such service. The ascertaining of the facts regarding utility service and the conditions affecting it is not so difficult as it is to present these intelligently to the public. Practically all utilities are becoming alive to their obligations and the public also is becoming more fair in its attitude. A utility that is constantly criticized unjustly is seriously hampered in rendering good service.

Only a prosperous utility can serve the public properly. This means, first, that the public must protect the bona fide investment in the utility. This is necessary in order to be able to secure the necessary capital for future developments. There has been a tendency of regulatory bodies to limit the rate of return allowed to utilities. This attitude should be liberalized in order to promote the best public interests. Mr. Freeman compared average utility returns to those of national banks; the latter during the past year have averaged about nine per cent on their invested capital, which is much greater than that of practically any utility. The latter must compete with industrial and commercial corporations in securing investors, which can evidently be done only by offering them a satisfactory and safe return on their investments. The utility should be encouraged to develop the highest possible efficiency in the rendering of its service, which is not done by limiting its rate of return. Mr. Freeman showed clearly that it is to the interests of the public to secure the maximum possible efficiency in service. He cited the case of two hypothetical companies rendering service under similar conditions, one of which is supplying electrical energy at a rate of nine cents per kilowatt-hour and, through very efficient management, is able to earn a rate of nine per cent on its investment, compared with a similar company supplying energy at a 10-cent rate, which, with ordinary management, is able to earn only eight per cent on its investment. According to the present tendency of regulating commissions, the former company would be penalized on the amount of its assumed excessive earning power. Instead of this, the former should really be encouraged to develop still better efficiency and better service.

Mr. Freeman pointed out the mutuality of the relationship that should exist between the utilities and the public. Much of the agitation on this subject in newspapers and the misrepresentation of facts by politicians and agitators tends to keep the relation between these interests distant instead of close. He felt that frank publicity of the facts of utility service will turn the edge of the poisoned sword wielded by professional agitators. He said he was optimistic of the outcome. He urged that engineers who are trained in making careful analyses of conditions should assist through their influence, after careful investigation, in bringing about a better relation between the utilities and the public.

The discussion of the subject was opened by J. G. Wray, who spoke of the marked reaction on the service caused by criticism by the public. He also referred to the influence of utility employees. E. G. Cowdery, president of the Peoples' Gas Light & Coke Company, Chicago, said that the strong antagonism against utility companies has been due largely to the prejudice against large corporations

that are presumed to make excessive profits. While the former practice of such corporations probably gave rise for this antagonism, utility companies at the present time are almost invariably trying to correct the erroneous impressions formerly created. He felt that a strong publicity movement was probably necessary; the facts must be disclosed. Utility interests are aware of their obligations and are trying to render the best possible service. In the office of his company many letters commending the service are received daily. The chief source of the animosity still existing is the agitation of politicians. These must be dealt with and they must be taught to get down to business principles. Therefore, he felt that it was a question of education all along the line.

John F. Gilchrist, vice president, Commonwealth Edison Company, said that one of the greatest obstacles that the utility has to contend with is in making its customers and the public in general understand the conditions bringing about certain features of utility rules and service. He cited a case of an unprofitable extension of a line several blocks in order to serve a single prospective customer, and the difficulty experienced in explaining to this customer the need for making a deposit to cover part of the cost of the line construction. Moreover, the ordinary business man does not even understand the utility business. For instance, the Edison company a few years ago had an invested capital of $50,000,000 and did a gross business of about $10,000,000 a year. This was contrasted with a prominent Chicago department store which had an invested capital of $2,500,000 and did a gross annual business of $10,000,000 a year. This illustrated the extraordinary difference in the turnover between the two companies. It is easy to see, therefore, that mercantile and similar companies that have a high rate of turnover can afford to earn a smaller rate on their gross business. The matter was discussed further by William J. Norton, Mr. Wilcox, P. Junkersfeld, Lyman E. Cooley, H. Almert, E. W. Allen, A. C. King, T. Milton, R. F. Schuchardt, R. H. Rice, E. N. Lake, A. P. Allen and Mr. Freeman.

NORTHERN WHITE CEDAR CONVENTION.

Report of the Twenty-First Annual Convention Held at Hotel Radisson, Minneapolis, Minn., January 30 and 31.

As stated in our last issue, the twenty-first annual meeting of the Northern White Cedar Association, which was held at the Hotel Radisson, Minneapolis, Minn., January 30 and 31, was one of the most successful held in the history of the Association. In his presidential address Mr. Partridge called attention to the unusual conditions which existed during 1916 and which resulted in material increases of prices of practically all commodities. However, prices of cedar poles remained the same in spite of the fact that the cost of production was greatly increased. Mr. Partridge stated that one of the most important features of the work during the past year was the advertising campaign carried on in conjunction with the Western Red Cedar Association in the electrical journals. He stated that in response to this advertising many inquiries have been received from all sections of the United States and foreign countries.

Secretary Boucher presented a very comprehensive report outlining in detail the work which was accomplished by the various committees of the Association. These committees, which also subsequently reported, comprise the Publicity and Welfare Committee, Legislation Committee, Insurance Committee, Railroad Committee, Shingle Committee, Pole Committee, Inspection Committee and several special committees.

An interesting feature of the Legislation Committee's work was the movement fostered to have established, in connection with the University of Minnesota, a Bureau of Research in connection with the Forestry Department.

NATURE OF THE POWER REQUIREMENTS OF THE ELECTROCHEMICAL INDUSTRY.

Address by F. A. Lidbury Before Joint Meeting of Electrical Engineers in Chicago.

An address on this subject was made on January 22, before a joint meeting held in Chicago by the Chicago Section, American Institute of Electrical Engineers, and the Electrical Section, Western Society of Engineers. The speaker was F. A. Lidbury, manager of the Oldbury Electrochemical Company, Niagara Falls, N. Y., and past-president of the American Electrochemical Society.

One is apt to group all the electrochemical industries together, but on analysis, said Mr. Lidbury, they are found to differ among themselves with reference to the power problem and other conditions. With certain exceptions they may be discussed in general, however. Respecting their national development, the electrochemical industries may be classified into three groups: First, those that cannot be dispensed with in this country because they have been strongly developed and are an essential part of other important industries, such as electrolytic refining of copper, copper production being a large and well established industry; second, those industries which have been and are being developed because of certain favorable conditions, such as low cost of power; third, those industries which have not yet obtained a footing in this country. The first class is not seriously affected by power costs, because these form a minor feature of the total cost, which includes such large factors as transportation and interest on investment.

Power Consumption of Different Electrochemical Industries.

Of the second class, doubtless the most important as a power consumer at present is the aluminum industry, for whose needs about 130,000 kilowatts of capacity is now installed in this country and about 60,000 additional kilowatts is being installed or contemplated in the near future. This industry is steadily increasing and prabably will continue to do so, because its development is due to so large an extent to the demand for aluminum in the automobile industry. Next in line, is the production of ferro alloys, such as ferro-silicon, ferro-chromium, etc.; this industry calls for some 100,000 kilowatts. The calcium carbide industry requires about 30,000 kilowatts; this industry is not growing rapidly, but the decreasing demand for carbide for illumination is about balanced by the increasing demand for it for acetylene welding. Then follows the abrasives industry, requiring nearly 30,000 kilowatts for the production of silicon and aluminum carbides. The electrolytic alkali industry, producing caustic soda, caustic potash, bleaching powder, liquid chlorine and other chlorine products, takes some 30,000 kilowatts. The manufacture of chlorates for matches, for use in the textile industry, for making oxygen, etc., takes about 15,000 kilowatts. Production of sodium for preparing bleaching compounds and sodium cyanide also takes about 15,000 kilowatts. In the manufacture of phosphorus, carbon bisulphide and other minor products, some 1,000 to 2,000 kilowatts each is required.

All of these industries have sprung up within the last 25 years and their products are indispensably needed in other most important and basic industries. For instance, ferro-silicon is required for the production of all open-hearth steel, which constitutes 70 to 75 per cent of all the steel now produced in this country. Likewise, the artificial abrasives made in the electric furnace have come to be the sole source of the raw material for grinding wheels. Before the war over one-third of this material was derived from natural abrasives imported from Europe; the cessation of these imports has made the electrically produced abrasives the only available source for this purpose. The other electrochemical industries referred to also produce products that are indispensable to many vital industries of the country.

The automobile, for instance, absolutely requires for its

manufacture the following electrochemical products: Aluminum, ferro-silicon, ferro-chronium, artificial abrasives, etc. The use of alloy steels has reduced the weight of the automobile to about one-half of what it was some years ago and has produced a stronger and safer car. Use of high-speed tools, made possible by the possibility of grinding with artificial abrasives, has very greatly reduced the cost of automobile manufacture and increased the output. In the electrical industry proper, the production of silicon steel has enabled most important economies through reduction in the core losses in transformers and electrical machinery in general.

Taking up the third class of electrochemical industries (those which have not yet been developed in this country) Mr. Lidbury spoke of the growing need for artificial fertilizers, such as are obtained by the electrical fixation of atmospheric nitrogen. He also touched on the rapid increase in electric furnace methods of refining of steel, use of electric furnaces for steel-casting work, and the electrolytic production of zinc. The latter has developed with extraordinary rapidity since the outbreak of the European war, there being now in use or in process of installation, nearly 90,000 kilowatts for this purpose alone.

Need for Cheap Power at Points of Advantageous Utilization.

A matter of vital importance to the development of the electrochemical industries, especially of the second and third class, is their need for cheap electric power. Cost of power affects these industries to different degrees, varying from 15 to 60 per cent or even more. With the exception of few cases, there is very little electric power available in this country at less than $18 to $20 per horsepower-year, which price has enabled the electrochemical industries to make the substantial headway they now have achieved. Now there is a much greater demand for electrochemical products than the electrochemical industries can supply. The difficulty is not one so much of cost of electrical energy, because this has been satisfactory to the industries already established, but the inability to get the necessary additional energy needed at low rates. This means lack of cheap hydroelectric power. Except at Niagara Falls and in the West very little undeveloped water power exists in this country.

On the Pacific Coast it is plentiful, but the haulage of electrochemical products across the continent to their place of consumption among the Eastern factories is a serious item. In the case of aluminum, to produce it on the western coast and ship it to the East at the same total cost as now obtains by producing it at Niagara Falls, would necessitate a power cost of but $8 a horsepower-year against the prevailing cost of $20. In the case of other products it would be necessary to supply the power for nothing, or even give a bonus with it in order to pay for the transcontinental freight on the products. In the case of the alkali products there is a differential of nearly $300 a horsepower-year between eastern and western production.

Electrochemical plants have been established in other places, chiefly aluminum plants, but usually where there was a ready market for their products. The ability to get cheaper power caused a cyanimide company to locate at Niagara Falls, Canada, instead of in this country. Other companies have gone to Canada, some to Norway, and some to France, or wherever cheap power was available near the place of utilization of their products, or near some place from which those products could be shipped cheaply.

Need for Continuity of Power Supply on Flexible Basis.

Off-peak power from central-station plants has been proposed. On the face of it, it seems like a good proposition, but it is impossible to get the central-station man and electrochemical man to agree on what is cheap power. The increased cost of the electrochemical plant, due to operating at part load for some hours each day, more than offsets the reduction of power cost by eliminating the fixed charges on the electric central-station plant. It is also very difficult to bring the two interests on a common ground of deciding on a rate mutually satisfactory to both. Moreover, regularity of power supply is almost as important as cheap power, and power in favorable localities.

Furthermore, there is a fourth consideration, namely, that the power supply be flexible, or capable of meeting the increased demands of prosperous years and the reduced demands of lean years. In purchasing raw materials, the electrochemical company is not seriously restricted, whereas in purchasing power the contracts are usually too inflexible.

Solution of Problem of Electrochemical Power Supply.

Mr. Lidbury expressed the fear that there is no immediate prospect of meeting the urgent power needs of the electrochemical industries through hydroelectric developments. This is due chiefly to erroneous governmental restrictions based on sentimental or short-sighted grounds. For instance, the situation at Niagara Falls is a crime against conservation. The power shortage there has been acute in the face of millions of horsepower going absolutely to waste. If left as they are, the Falls will themselves mar their scenic beauty due to the rapid erosion at the Horseshoe Falls. He felt that it would be best for the interests both of this country and Canada to develop the Niagara Falls power up to about 60 per cent of its maximum possibilities, thus utilizing this invaluable resource to the extent of some 3,000,000 horsepower.

The co-operation of engineering societies was strongly urged in bringing about more reasonable legislation respecting water-power development. Until this can be made less restrictive and on a true conservation basis, the electrochemical industries will have to depend on steam power auxiliaries to existing hydroelectric plants. Mr. Lidbury spoke of the possibility of developing electricity at the switchboard for from $17 to $18 per horsepower-year in modern steam plants of 20,000 to 30,000 kilowatts supplied with coal at $2 a ton. With coal at $1.10 a ton, as at the mines, it should be possible to bring the cost down to about $14 a horsepower-year. The erection of such plants at the mines, Mr. Lidbury thought, should become highly expedient and economical. They would solve the need for a flexible and cheap source of additional power supply, at any rate until hydroelectric development could be continued on a reasonable basis.

The electrochemical companies with but few exceptions, such as those making ferro-alloys, cannot afford to put up their own steam generating plants. Their chemical plants proper are subject to a very high obsolescence, both of chemical equipment and processes, and their amortization period is normally only six years. Help must therefore come from the power companies. If they cannot be encouraged to develop the additional power needed, further expatriation of electrochemical industries is bound to result.

The subject was discussed by W. C. Bauer, P. Junkersfeld, H. M. St. John, William T. Dean, E. J. Fowler, W. E. Williams, S. Montgomery, Arthur Wright, and Messrs. Taylor and Lidbury.

MAJOR JOHN J. CARTY, OF THE AMERICAN TELEPHONE AND TELEGRAPH COMPANY.

Appointment Is in Recognition of His Invaluable Contributions to Wire Communication.

The following, respecting John J. Carty, the distinguished telephone engineer, is taken from the *Army and Navy Journal* of January 27, 1917:

Mr. J. J. Carty, chief engineer of the American Telephone and Telegraph Company, New York City, and recognized as one of the foremost authorities in the world on wire communication, has been commissioned senior major in the Signal Officers' Reserve Corps, the reserve auxiliary of the Signal Corps, U. S. A. The addition of Mr. Carty to that organization will be a decided accession and one

which will be widely applauded. It is believed other appointments will follow from the ranks of leading American engineers. The importance of the telephone system in any plan of national defense has been accepted by officials of the War Department. The adaptability of the American telephone lines was thoroughly proven last summer when the entire A. T. & T. Company's service was turned over to the Government for a test under hypothetical war conditions. In 45 seconds Secretary Daniels was in communication with the Pensacola, Fla., Navy Yard, and in 28 seconds more was talking with the navy yard at San Diego. The Secretary of the Navy later expressed his pleasure over the "wonderful success" of the experiment. When the country's National Guard was mobilized last summer a complete telephone exchange was established at Camp Whitman, in New York State, in less than 24 hours after the troops were called out, connecting Washington with Albany, N. Y., and all the vital points necessary to the movement. The commissioning of Mr. Carty as an officer in the Reserve Corps may be taken as a further step to have this important branch of the country's defensive system ready, not only in material, but in personnel.

IOWA CONTRACTORS ASK FOR MORE STRINGENT INSPECTION LAWS.

Semi-Annual Convention of State Association Held at Cedar Rapids Considers Many Important Topics.

The need for more stringent laws relating to electrical construction work in Iowa was voiced by the semi-annual convention of the Iowa Electrical Contractors' Association held at Cedar Rapids January 30 and 31, at which a committee was appointed to take the necessary steps to bring this matter before the State Legislature.

Various activities, looking to a closer co-operation of electrical contracting interests in the state, were discussed, organization requirements being outlined by Mr. Poelma, representing the Chicago Electrical Contractors' Association. Mr. Poelma referred to the important position in society which is occupied by the electrical contractor and he explained that an active organization is necessary in order to see to it that the proper laws are enacted to protect the public against inferior electric wiring by making electrical contractors responsible.

One of the interesting features of the meeting was an address by Mr. Browne, president of the American Electrical Supply Company, Chicago, who presented figures on comparative costs of labor and material and outlined the fundamentals of a plan for starting and operating a business such as electrical contracting. He stated that losses in the electrical contracting business are becoming less each year. He thought that the greatest trouble is that the contractor tries to do too much work for the amount of working capital he has. He advanced the idea of inaugurating a business on a business basis by figuring beforehand the estimated amount of expense for operation and then planning to secure enough business to keep the overhead at a certain point.

O. O. Roe, state fire marshal, delivered a very interesting talk on state-wide compulsory inspection under the supervision of the state, and J. R. Colville of the National Lamp Works, Cleveland, gave an illustrated lecture on modern, semi-modern and poor lighting of residences.

A paper by Joseph Fowler, of Memphis, covering costs of labor in different kinds of electrical construction, was accorded a great amount of consideration and a local committee appointed to work in conjunction with the National Association.

The Nelson System for Competitive Bidding (described fully in our issues of January 20 and 27), was discussed at some length by Mr. Kunkle of Davenport and received the endorsement of the Iowa Association. It was the consensus of opinion that some similar system would undoubtedly be universally adopted by electrical contractors.

The business portion of the program was concluded by an interesting address by C. W. Warsam of Iowa City entitled "Know Your Goods."

The entertainment features of the convention included a banquet at the Montrose Hotel and visits to the Electrical Show, which was held in Cedar Rapids during the convention.

The next meeting of the association will be held in May, at Des Moines, Iowa.

POLE STATISTICS FOR 1915.

Government Issues Report Covering Poles Used by Utility Companies During Year 1915.

The United States Forest Service, through its office of Industrial Investigations, has compiled statistics on the number of poles purchased during 1915 in the United States by the telephone and telegraph companies, steam and electric railroads, and electric light, heat and power companies. The census was taken exclusively by correspondence with approximately 17,000 purchasers, representing practically all the pole users in the country. About 12,000 concerns returned schedules in reply to either the first or the second request for data. This was 70 per cent of the total number of concerns to which inquiries were sent. Actually, however, the figures given in this bulletin represent between 90 and 95 per cent of the poles purchased, because the non-reporting companies were principally the smaller ones.

Information regarding the prices paid for the various species of poles was not requested.

Table I shows the number of poles purchased each year from 1907 to 1911 and for the year 1915, by kind of wood. Figures for 1911 and previous years were taken from reports compiled in co-operation with the Bureau of Census. Statistics were not obtained for the years 1912 to 1914.

TABLE I.—POLES PURCHASED, BY KIND OF WOOD, 1907 TO 1911 AND 1915.

Kind of wood.	1915	1911	1910	1909	1908	1907
Cedar	2,521,769	2,100,144	2,431,567	2,439,825	2,200,139	2,109,477
Chestnut	651,643	693,489	677,517	608,066	516,049	630,282
Pine	546,233	161,690	184,677	179,586	116,749	155,960
Oak	199,442	199,590	265,290	236,842	160,702	76,450
Cypress	67,644	72,995	75,459	77,677	90,579	100,368
All other	91,233	190,112	236,184	196,744	164,936	210,731
All kinds	4,077,964	3,418,020	3,870,694	3,738,740	3,249,154	3,283,268

A total of 4,077,964 poles was reported as purchased during 1915, which represents an increase of 659,944, or 16 per cent, as compared with the number reported purchased in 1911. It is the largest number of poles reported in any single year.

The annual demand for poles, which now exceeds 4,000,000, was supplied principally from three different regions of the United States: The northern white-cedar region of the lake states, the chestnut region of the eastern portion of the country, and the western red-cedar region of the Northwest, which includes Idaho, Oregon and Washington.

The principal properties called for in pole timbers are durability, strength, lightness, straightness and a surface which takes climbing irons easily. All of the species of cedar reported purchased combine practically all of these properties in a high degree.

Cedar (including northern white, western red, southern white and red) supplied 2,521,769 poles, or 61 per cent of the total number purchased. This is an increase of 421,625, or 16 per cent, as compared with the number purchased in 1911.

Next to cedar comes chestnut, which showed a decrease of 42,846 poles, while pine showed an increase of 384,543, or 70 per cent, as compared with the 1911 purchase. Most

of the pine reported was that commonly known as southern yellow pine, and includes longleaf, shortleaf and loblolly. Of these, the longleaf is the most durable. It is reported that loblolly pine gives very brief service unless it is treated with a preservative. Western yellow pine was also reported in small quantities, but, like loblolly, it requires a preservative treatment to insure reasonable length of service.

Oak poles were purchased in practically the same number as in 1911, while cypress poles showed a decrease of 5,351 poles. The use of cypress as a pole timber seems to be falling off each year. Cedar, chestnut and pine together formed over 91 per cent of all poles reported purchased, cedar alone, as before stated, constituting over 61 per cent.

The minor species reported were redwood, spruce, tamarack, and osage orange. All of these, however, were reported in small quanties.

Table II shows the number of poles purchased, classified by length and by kind of wood. Poles are usually purchased in the round form, although occasionally a purchaser reported several species being sawed. However, these are of minor importance and were either redwood or western pine.

TABLE II.—POLES PURCHASED, CLASSIFIED BY LENGTH AND BY KIND OF WOOD, 1915.

Kind of wood	Total	Under 20 feet	20 to 29 feet	30 to 39 feet	40 to 49 feet	50 feet and over
Northern white cedar	1,747,210	540,565	755,311	373,874	67,358	10,102
Chestnut	651,643	23,992	255,951	295,717	63,676	12,307
Western red cedar	567,770	17,874	314,010	139,041	71,608	25,237
Pine	546,233	373,688	69,931	65,004	23,914	13,696
White oak	177,799	120,393	33,550	16,120	5,998	1,738
Red cedar	117,545	94,997	14,870	5,624	1,541	513
Southern white cedar	89,244	4,414	13,282	49,264	15,734	6,550
Cypress	67,644	13,048	22,211	26,316	4,542	1,527
Red oak	21,643	3,737	16,341	1,280	139	146
All other	91,233	43,986	35,984	7,851	1,726	1,686
All kinds	4,077,964	1,236,694	1,531,441	980,091	256,236	73,502

Poles are generally classified commercially in five-foot lengths and by diameters at specified points, principally at the tops and six feet from the butts. To condense the figures the poles shown in the above table are divided into classes differing in length by 10 feet.

Of the total number purchased 2,768,135, or 67 per cent, were under 30 feet. Poles of these lengths are most commonly used by the telephone and telegraph companies. The poles under 20 feet in length were reported chiefly by the rural telephone companies. Among the prominent woods reported under this classification were northern white cedar, pine and white oak. The number of poles ranging from 30 to 50 feet in length aggregated about 30 per cent of the total, while those exceeding 50 feet in length represent but a small proportion.

All of the leading woods covered by the table contributed poles of all lengths, although red oak contributed but a small per cent of the larger poles. More than half of the white oak and pine poles were under 20 feet in length.

BROOKLYN EDISON COMPANY HOST OF ELECTRICAL MEN.

Eleventh Annual Dinner Attended by Over 500 Co-Operators.

The Edison Electric Illuminating Company of Brooklyn gave its eleventh annual dinner to the electrical men of Brooklyn at the Academy of Music in that city on February 1, 1917. There were some 500 present, with a head table list of 23, comprising the following gentlemen: P. R. Atkinson, Theodore Beran, Irving Bush, William J. Clark, H. M. Edwards, H. P. Erwin, Bernard Gallagher, Hon. William Hayward, Hon. H. W. Hodge, T. I. Jones, J. W. Lieb, T. C. Martin, J. B. Murray, Hon. L. H. Pounds, Charles W. Price, O. F. Quist, W. S. Rugg, F. W. Smith, Elmer A. Sperry, Charles G. M. Thomas, J. C. Van Duyne, W. F. Wells, Hon. T. H. Whitney.

T. I. Jones was the presiding officer and toastmaster. After the enjoyable banquet, which had been interspersed with music and screen portraits, with life histories, of many of the guests, addresses were delivered, as follows: "Brooklyn and the Brooklyn Edison," by W. F. Wells, vice-president, Edison Electric Illuminating Company of Brooklyn; "Brooklyn as an Industrial Center," by Irving T. Bush, president, Bush Terminal Company; "The Contractor and the Company," by Oswald F. Quist, president, Kilowatt Club; "Brooklyn's Future," by Hon. Lewis H. Pounds, president, Borough of Brooklyn; "The Public Service Commission," by Hon. Travis H. Whitney, Public Service Commissioner, First District.

It is evident that there is a poet of ability on the staff of the Brooklyn Edison Company, for the songs which were participated in during the evening all had an electrical turn, each having been paraphrased from some well known melody.

The Committee of Arrangements consisted of the following-named gentlemen: W. H. Wells, chairman; R. C. Bach, J. M. Cohen, G. B. Cooper, H. G. Disque, J. E. Gutfleisch, G. J. Leibman, H. S. Musgrave, J. H. Porter, M. S. Seelman, Jr., C. H. Stevens, J. E. Weismandel, J. L. Wiltse.

Electrical Exports for November Establish Another New Monthly Record.

Monthly records for electrical-export totals have again been broken by the unprecedented total value of electrical shipments from the United States during last November. In the summary of the foreign commerce for that month issued by the Bureau of Foreign and Domestic Commerce, Washington, D. C., it is shown that electrical exports in November exceeded by over 9 per cent the record of the preceding month and by over 61 per cent the total of November of 1915.

For the four electrical classes for which the numbers shipped are given in the government report, there were exported last November the following: Electric fans, 1,614; arc lamps, 89; carbon-filament lamps, 147,513; metal-filament lamps, 731,616.

The following table gives the detailed figures for last November and for the corresponding month of the preceding year:

Articles.	Nov., 1916.	Nov., 1915.
Batteries	$ 308,005	$ 184,903
Dynamos or generators	182,653	58,850
Fans	21,169	55,849
Insulated wires and cables	725,503	302,089
Interior wiring supplies, etc. (including fixtures)	55,069	79,580
Lamps—		
Arc	731	2,115
Carbon-filament	14,492	13,186
Metal-filament	121,623	98,703
Meters and other measuring instruments	76,272	85,113
Motors	410,211	293,540
Telegraph instruments (including wireless apparatus)	54,562	12,154
Telephones	189,923	30,308
Transformers	72,496	170,632
All other	2,188,826	1,357,825
Total	$4,421,535	$2,744,847

For the first 11 months of the last three years the electrical export totals were as follows: 1914, $18,342,552; 1915, $22,164,250; 1916, $35,494,803.

MASSACHUSETTS CONTRACTORS' ASSOCIATION ACTIVE IN IMPROVING CONDITIONS.

Inaugurates Movement to Standardize Socket Numbering—Engages Audit Company to Supervise Installations of Accounting Systems.

The Electrical Contractors' Association of Massachusetts has decided to hold a mid-winter meeting as an annual event, and for this year has assigned Wednesday, February

21, when sessions will be held at the Quincy House, Boston, in the afternoon, with a banquet in the evening.

The jobbing houses of Boston will give special attention to contractors who may visit them on that day.

The program is tentatively as follows: 3 to 4 p. m., business meeting for members only; 4 to 4:30, reception to non-members and visitors; 4:30 to 6, paper by a representative of the New England Audit Company; 6 to 7:30, dinner, followed by informal general discussion. Speakers from New York and New England are expected to address the meeting.

The following officers have been elected for 1917: President, Alfred J. Hixon, Boston; first vice-president, Arnold J. Stone, Brockton; second vice-president, Wilbur F. Evans, Boston; secretary, J. E. Wilson, Boston; treasurer, Frank L. Barnes, Boston; directors, the above and W. K. Tuohey, Springfield; J. P. Coghlin, Worcester; H. W. Jones, Lenox; Carl G. M. Miller, Boston; Henry C. Barden, Attleboro; Samuel Cook, Northampton; Fred A. Packard, Boston, and Mason C. Gates, Fitchburg.

The Contractors' Association has addressed a letter to manufacturers of sockets in which it commends their action in adopting systems of numbering, but calls attention to the great convenience which would result.

The association has received many replies to the suggestion, which seem to meet with general approbation. It will have to be considered, however, by the Socket Section of the Associated Manufacturers of Electrical Supplies.

A firm of accountants, the New England Audit Company, Springfield, Mass., has been engaged as consulting accountants and auditors of the association for the primary purpose of counselling members in installing and directing the operation of accounting methods. In a letter to the secretary it suggests that members adopt a simple system for financial and cost-accounting and the preparation of estimates, and that systems be uniform for all contractors. "No single factor contributes more to fair competition among those engaged in the same line of business than uniformity in methods of accounting and estimating," it says. "No efficient organization need fear fair competition."

Any member is at liberty to consult the company on matters of office methods and accounting once annually without charge. Further service will be a matter of private arrangement between the company and the client.

NEW YORK JOBBERS MEET.

Enthusiastic Meeting of the Metropolitan Electrical Jobbers Association on January 17.

What is considered by members and guests to be the most successful meeting of the Metropolitan Electrical Jobbers' Association, was held in New York City on January 17, 1917, under the supervision of C. P. LaShelle, president of the Association.

Following an established precedent, dinner was served early in the evening, this being followed by an address by the president, during the course of which he congratulated the Association on the splendid work it had accomplished for many jobbers in the Metropolitan zone, calling attention to the fact that this was possible only because of the loyal co-operation on the part of all members in the Association.

Subsequent to the routine order of business, Mr. LaShelle introduced William G. Campbell, eastern sales manager for the Safety Armorite Conduit Company. Mr. Campbell's address was most impressive, and he especially interested his listeners when he stated that in event of cessation of hostilities in Europe, he could hardly see where the electrical business would feel an immediate depression, as manufacturers of structural steel and accessories had on hand such a large volume of domestic orders, that it would require nearly one year to complete orders for which bona-fide domestic deliveries were specified.

Another interesting address was delivered by William A. Neefus of the Kirk Fuse Company, whose subject was "Fuses and Their Practice in Electrical Construction."

The feature of the meeting was an informal talk by Arthur F. Stanley, who was introduced as the dean of New York retail business, having continuously been identified with the electrical industry in New York since 1870. After expressing his best wishes for a continuance of success of the Metropolitan Electrical Jobbers' Association, Mr. Stanley placed a concrete value on his words by presenting his application for membership, thus identifying one of the oldest electrical workers in the city, with the newest organization for trade promotion.

A motion to adjourn was then presented, but instructions were given to the president to call another meeting within one month. The present officers of the Association are C. P. LaShelle, president; L. D. Bailey, vice-president; Meyer Rutkin, treasurer, and Meyer Zucker, secretary.

Dinner of Metropolitan Electrical Jobbers' Association in New York.

Miscellaneous NEWS NOTES

Electrical Section, Western Society of Engineers, Elects Officers.—At a meeting of the Electrical Section of the Western Society of Engineers, held recently in Chicago, officers were elected for the ensuing year, as follows: Chairman, Edwin W. Allen; vice-chairman, Leslie L. Perry; member of executive committee, C. A. Keller.

Influence of Commercial Conditions on Transmitter Construction.—A meeting of the Institute of Radio Engineers was held in the Engineering Societies Building, New York, on February 7, at which Julien Barth presented a paper entitled "The Influence of Commercial Conditions on Transmitter Construction." Mr. Barth described four interesting types of radio transmitters including cargo ship sets, special land station sets and moderate high power land station sets.

Society of Terminal Engineers Formed.—The Society of Terminal Engineers has just been chartered under the laws of the State of New York with headquarters in New York City for the purpose, among other things, of promoting the study of terminal engineering and mechanical freight handling as a specialty. The new organization has three grades of membership, viz., members, associate members and juniors. The secretary is J. Leonard, 1133 Broadway, New York.

Kansas City League Participates in Civic Affairs.—The Jovian League of Kansas City, Mo., which began its present administration with the purpose of taking a more active part in civic affairs, has already been recognized as an important factor. At the recent semi-annual meeting, reports were made of invitations to participate in discussions, and actual work done along this line. The League has been invited by the mayor to participate in a general committee he is naming to study the question of light and power in Kansas City.

To Increase Scope of Board of Utility Commissioners of New Jersey.—A bill has been introduced in the New Jersey Legislature providing for an enlargement of the powers of the Board of Public Utility Commissioners, giving the Board authority to order the installation of gas, sewer and water pipes and other conduits in a street before the street is permanently improved, particularly in cases where there is not a sufficient number of consumers to make the investment profitable at the time. It is provided, however, that the Board must be assured of a reasonable interest charge upon the investment thus made by the company until such time as the business along the thoroughfare renders the investment profitable. The bill is intended to eliminate the necessity for opening up a new street after permanent paving improvement has been made.

Chicago Traction Report Explained to Electrical Men.—At the meeting of the Electric Club-Jovian League of Chicago held on February 1, an illustrated address was made by Bion J. Arnold, member of the Chicago Traction and Subway Commission. Mr. Arnold explained the main features of the comprehensive report recently made by the Commission to the City Council, in which unification of all urban transportation systems was urged and much new construction and extension of rapid-transit lines was recommended. Points brought out particularly were the much lower cost of construction of elevated as compared with subway lines, the justification of a small transfer charge of one or two cents in changing from surface to elevated lines (which now requires another five-cent fare), the need for financing the improvements and new construction on a basis that will attract investors, and the proposed scheme for amortization by which the entire unified system, surface, elevated and subway, would become the property of the city within some 40 odd years without any expenditures on its part by direct taxation.

Rejuvenation at Kansas City.—The Jovian League of Kansas City, Mo., held a rejuvenation January 26, when five candidates were initiated. The membership now includes 296. Dr. W. S. Abernathy delivered an address, appealing to men to make their individualities felt—after developing their individualities.

Park Lighting for Denver Company.—At a recent meeting of the municipal advisory park board in Denver it was decided to install two miles of new lights in the municipal parks. This will include putting in more than 100 new lights at a cost of approximately $2,000 to the city, and will necessitate the installation of a considerable amount of new conduit by the Denver Gas & Electric Light Company.

Toledo Company to Flood-Light McKinley Statue.—Influenced by the successful flood lighting of the Statue of Liberty in New York harbor, and through the efforts of the Toledo Railways & Light Company, operated by Henry L. Doherty & Company, the McKinley monument in Courthouse Park, Toledo, will be similarly illuminated. The lighting will be effected by erecting searchlights opposite the statue and will entail no overhead wires.

American Lighting for Office of President of China.—Announcement has been made that the agent in China for a special system of indirect lighting of American manufacture has arranged to supply an outfit for the private office of the president of China. A transaction of this character, while a small matter in itself, should have a considerable advertising value and will undoubtedly do much to increase the prestige of American goods of this class.

Meeting of New York Section, Illuminating Engineering Society.—The monthly meeting of the New York Section, Illuminating Engineering Society, was held in the Engineering Society's Building on the evening of February 8. A paper by A. H. Rudd, signal engineer of the Pennsylvania railroad entitled, "Position-Light Signals for Railroad Service," was presented, in which the experiments made by the Pennsylvana Railroad in its experimental line from Philadelphia to Paoli, were discussed. A motion-picture entertainment was held at the conclusion of the discussion.

Louisville Jovians Elect Officers.—Fred V. Gantt, branch manager at Louisville for the General Electric Company, was elected president of the Louisville Jovian League at the annual meeting held recently at the Seelbach Hotel. W. S. Clark was elected vice-president and C. C. Dicken, secretary-treasurer; J. O. Bland, F. H. Miller, P. S. Pogue and J. B. Riley were chosen to the Board of Directors. This was the "insurgent" ticket, Mr. Gantt succeeding F. H. Miller, who retires after a year's service. The annual meeting was in the form of a banquet and was attended by 125 members of the League. Mr. Gantt in accepting the presidency, stated that he was going to work for co-operation of all the members. One of the speakers was W. H. Hodge, publicity manager for H. M. Byllesby & Company.

P. L. Thomson Addresses St. Louis League.—At the luncheon of the St. Louis Jovian League, on January 30, P. L. Thomson, advertising manager of the Western Electric Company delivered an interesting and instructive address on results obtained in co-operative advertising campaigns. In his talk, Mr. Thomson outlined the value of such campaigns as found in the fact that they brought new business and an expansion reflecting to the advantage of the entire electrical industry, being far more constructive and more profitable than advertising designed to promote competition in an already developed field. Mr. Thomson's business tour of the country will not be completed until April, when he will return to his New York office. M. P. Linn, president of the St. Louis Advertising Club, presided as chairman of the meeting.

Electricity in a Large Grain Elevator

Details of the Electrical Installation in the Soo Line Elevator in Minneapolis Which Uses 2050 Horsepower in Motors and Purchases all Energy from Local Central Station

By T. H. KETTLE

Industrial Power Series—Article No. 191

THE function of the modern elevator is to receive, clean, store and ship grain according to the demands put upon the grain business of the country

A few days ago the writer was given an excellent opportunity to study the many uses of electricity in a modern elevator and the object of this article is to describe such a trip through the Soo Line Terminal elevator located in Minneapolis, Minn.

No attempt will be made to describe the methods of securing this class of business or the necessary points that should be taken into consideration when dealing with such loads, as these points were dealt with in detail in a previous article.

The accompanying illustrations will also help to a better appreciation of a few of the various applications in use.

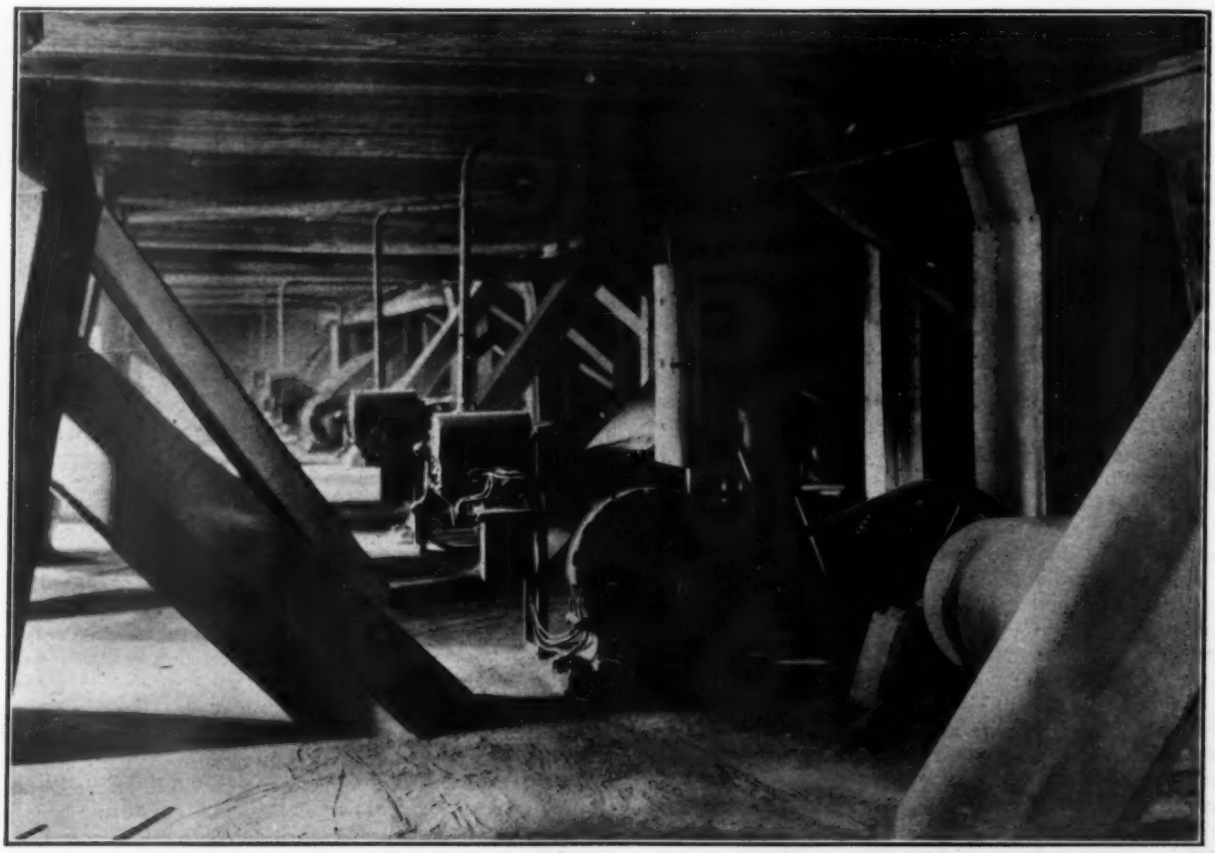
Perhaps the most interesting phase of the actual signing of the contract was the fact that the business was assured from the very beginning. Of course the directors of the elevator company investigated the isolated-plant question, but this was never a contending or deciding factor. The fact is, that upon investigation of the rates submitted the elevator company immediately decided that the use of central-station service was economically necessary and financially sound.

So then, as far as any real competition was concerned, there really never was any to speak of. This being so, it was of course only necessary for the central station to keep in close touch both with the general contractors and also the electrical contractor handling the actual work.

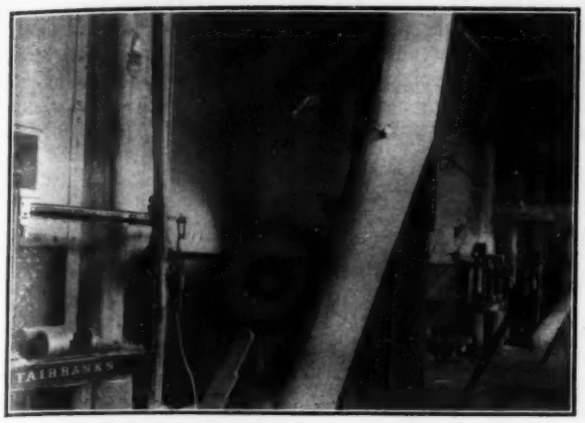
In order therefore to have a clear understanding of the various ways in which electricity is used it might be well to study the method of service, and then the different applications as we come to them.

To begin with, this elevator, having a total connected load of 2,050 horsepower, is supplied by a separate and distinct 13,200-volt, three-phase, 60-cycle feeder, terminating in a specially constructed substation, built and maintained by the central station. This transformer station is located on the elevator company's property and contains three 500-kilovolt-ampere transformers, reducing 13,200 volts to 2,200 volts, three phase, with the necessary switching equipment.

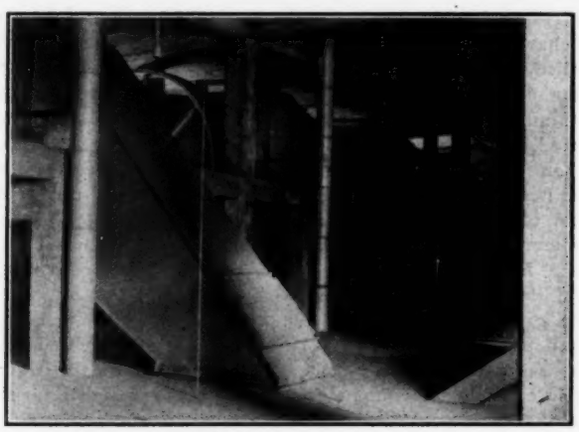
From this station runs a 2,200-volt feeder to the elevator company's own transformer station, which is a part of the elevator proper, and which also contains three 500-kilovolt-ampere oil-filled self-cooled transformers to transform from 2,200 volts down to 440 volts, three phase. Each one of these transformers has four 2.5 per cent taps on the



20-Horsepower Motors Driving Storage Belt Conveyors in Soo Line Elevator, Minneapolis.



Scale Floor Showing Leg-Signal System.



General View of Head Floor.

primary side for adjustment of voltage losses. There is also situated in this station one 30-kilovolt-ampere single-phase transformer with 5 per cent taps on the primary side, for the lighting requirements of the whole plant.

Also located in this, the elevator company's substation, is the main-line service panel which controls the incoming three-phase, 2,300-volt circuit from the central station's substation. This panel contains the following apparatus:

One triple-pole single-throw automatic oil switch with overload trips, operated by current transformers. This switch has a capacity of 900 amperes at 4,500 volts.

Three low-voltage release coils with series resistances to operate on 110-volt circuit and with voltage transformers 2,200/110 volts.

Three current transformers, 500 amperes capacity, five-ampere primary current.

There is also installed on this panel, the automatic oil switch and the metering transformers of the central station.

The connections between the switch on this main service panel and the lines of the central station are made by lead-covered three-conductor cables, each conductor being of 400,000 circular mils across section and insulated for a working pressure of 3,000 volts.

In addition to this main service panel, there is installed in this substation the necessary switchboard panel for controlling the various outgoing circuits throughout the plant and elevator as a whole.

The switchboard consists of five panels of black Monson slate and is properly secured to an angle-iron frame. The frame is built of angle iron of 0.25-inch thickness, and has all corners gusseted, the whole being thoroughly japanned.

All busbars are of hard-rolled copper and of laminated type, and are made up of a sufficient number of one-eighth-inch straps for a current density of 1,000 amperes per square inch.

Running from this main switchboard are the various feeders to the different motor and lighting panels throughout the plant; each one of these feeders is run in conduit, exposed on ceilings, walls and columns, and is properly numbered.

All power lines are 440 volts, three phase, while the lighting feeders are 230/115 volts three-wire system.

Each motor throughout the plant is equipped with a time-limit automatic overload release, suitable for the running load of the motor. All compensators and motors were furnished by the Allis-Chalmers Manufacturing Company.

All lighting throughout the whole elevator is furnished by 40-watt Mazda lamps and is controlled from one distributing cabinet located on the first floor.

Leg-Signal System.

Perhaps one of the most interesting features of the whole plant is the leg-signal system, which is installed between the first and scale floors of the working house. This consists of a complete electric-lamp signaling system. Near the receiving and shipping legs on the first floor of the work house and adjacent to the scale beams on the scale floor, there is installed for each of the above legs, a double lamp signal. These lamps are mounted in steel boxes and for each lamp is provided a colored glass bullseye, three inches in diameter. These bullseyes are numbered to

General View of Cleaning Floor.

General View of Distributing Floor.

correspond with the leg with which they are to operate, by having a circular piece of brass the same diameter as the bullseye installed behind and against it. In the brass, the number is cut as large as possible so that when the lamp behind the bullseye is lighted, the number alone is illuminated.

On the first floor and in a steel cabinet, are installed the necessary magnetically operated switches for the operation of these lamps, and these switches are operated by momentary-contact switches, located in the lamp boxes. In each lamp box, there is a red lamp and a green lamp and the wiring is so arranged that for any one leg when the green lamp on the scale floor is lighted, the corresponding green light on the first floor is also lighted, and the same for the red light. The operation of the signal is interlocking, so that starting with the red lights turned on the scale operator may turn on the green lights, automatically turning off the red lights, but may not turn off the green lights. The first-floor operator may turn on the red lights, automatically turning off the green lights. Auxiliary contacts are also installed on the magnetic switches so that after the operation of the switch is complete, the control circuit is broken, thus protecting the solenoid winding against the possible sticking of a momentary-contact switch. Lamp boxes for the scale floor have bullseyes on the front and both sides, and are provided with light shields, so that the light intended for any one bullseye, will not illuminate any other one in the set.

Leg-Pit Signals.

Each receiving leg is provided with a receiving pit at each track in the track shed. There is also a complete lamp signal system between one pit and its respective interlocking levers, at the leg which it feeds. The lamp boxes at the pits are the same construction as those used for the scale floor, except that they have three bullseyes and two momentary-contact switches each. Each one of

Grain Elevator Data

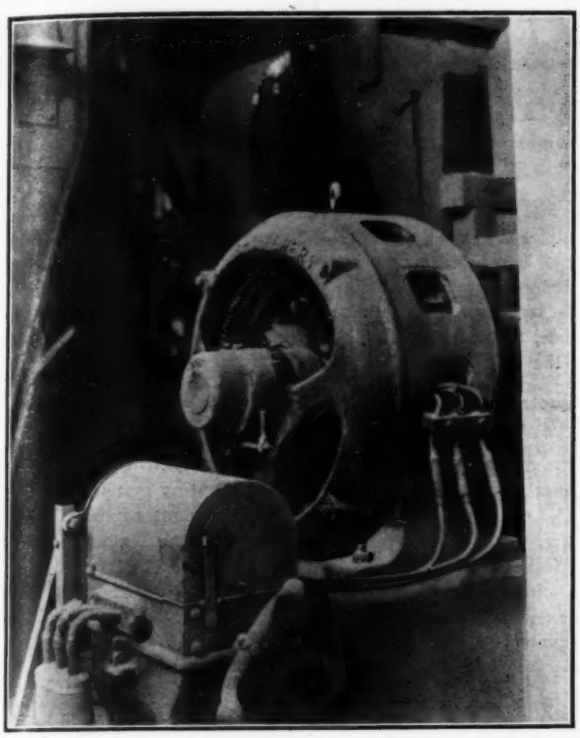
Soo Line Terminal Elevator Company, Minneapolis, general storage and cleaning. Mostly wheat handled. Number of men employed 40. Storage capacity: 30 large tanks, 22,000 bushels each, and 20 small tanks, 8,000 bushels each. Work house capacity, 40 large tanks, 7,000 each; 27 small tanks, 3,000 bushels each, and 9 small tanks, 900 bushels each. Total connected horsepower, 2,050. Total number of motors, 56. Average kilowatt-hours per month, 180,000. Maximum demand, 1,000 horsepower. Cars handled per day—200 in and out.

Motor Installation.

The following is a list of the motors with their respective drives. The supply source is three phase, 60 cycle, 2,200 volts, transformed on premises to 440 volts, three phase.

No.	Horse-power	Speed R. P. M.	Application.
4	100	690	Shipping legs 178-foot centers, complete with base, no pulley, 14-inch shaft extension.
3	100	690	Receiving legs 182-foot centers, complete with base, no pulley, 14-inch shaft extension.
2	75	690	Separator legs, 178-foot centers, complete with base, no pulley, 12.25-inch shaft extension.
2	25	850	One Richardson and one screenings leg, 178-foot centers, complete with base, no pulley.
1	35	690	One bleacher leg, 178-foot centers, complete with base, no pulley.
1	20	850	One bleacher leg, 90-foot centers, complete with base, no pulley,
1	20	850	One bleacher screw conveyor complete with base, no pulley.
1	15	850	One bleacher screw conveyor complete with base, no pulley.
3	10	850	Three receiving belt conveyors, 36-inch by 65-foot centers, complete with base, no pulley.
4	15	850	Four shipping belt conveyors, 36-inch by 140-foot centers, complete with base, no pulley.
5	20	850	Five storage belt conveyors, 36-inch by 130-foot centers, complete with base, no pulley.
1	25	850	Transfer belt conveyor, 38-inch by 180-foot centers, complete with base, no pulley.
1	10	850	Drier belt conveyor, 24-inch by 35-foot centers, complete with base, no pulley.
2	25	236	Power shovels, back-geared, complete with base, no pulley.
1	75	690	Complete without base or pulley. Extended shaft for flywheel on side opposite pulley.
1	50	690	Complete without base or pulley. Extended shaft for flywheel on side opposite pulley.
2	20	1120	Drier fans. Complete with base, no pulley.
2	10	1120	Drier fans. Complete with base, no pulley.
1	25	850	Dust-collecting system. Complete without base or pulley.
4	65	490	Clippers. Complete without base or pulley.
1	15	850	Four Richardson separators. Complete with base and pulley.
1	7½	1120	One bleacher pump. Complete with base and pulley.
1	10	1120	Screenings separator. Complete with base and pulley.
1	25	850	Two packers. Complete with base and pulley.
1	10	850	Screenings screw conveyor. Complete with base, no pulley.
3	35	690	Two clipper, one drier leg, 178-foot centers. Complete with base, no pulley.
2	10	850	One cupola clipper leg, screw conveyor, 1 Richardson cleaner. Complete with base, no pulley.
1	10	.....	Freight elevator. Direct-connected.
1	3	.....	Sump pump. Direct-connected.
2	30	1120	Six warehouse separators. Complete with base and pulley.

these boxes is installed conveniently on a column near the car pit for which they are intended. For each pit there is a corresponding triple lamp signal at the interlocking lever. At the interlocking levers the four car-pit signals



65-Horsepower in Soo Line Elevator Driving Oat Clipper.

may be combined with the scale-floor signal for that leg in the same box, and the three colors for the car-pit signals are red, green and white. The bullseyes, of course, are numbered in the same manner as specified for the leg signals. The operations of the signals are so interlocked by means of magnetically operated switches that the following sequence must be obtained, and it is not possible for an operation to be made in wrong sequence even if the button is pushed erroneously. Starting with the red light burning, the leg operator may turn on the green lights, automatically turning off the red lights. The pit operator may turn on the white lights, automatically turning off the green lights. The pit operator may then turn on the red lights, automatically turning off the white lights, but he is not able to turn on the red lights before he has turned on the white lights. The leg operator is not able to turn off either the red or white lights or turn on the green or white lights, these insuring complete safety in operation.

Straight Elevator Bell Signal.

Another very interesting signal system is the elevator bell system, which may be described as follows: At each landing of the elevator there is installed a six-inch, dust-proof bell, together with a push button. The wiring is so arranged that when any button is pushed, all of the bells will ring. These bells are all operated from a separate bell-ringing transformer, the wiring consisting of No. 16 gauge throughout, while the bell-ringing transformers are tapped from the nearest lighting circuit.

A glance at the accompanying illustrations will give an excellent idea of the elevator in general and a view of the motor applications. Data regarding the motors are given in the accompanying table.

Energy is supplied by the Minneapolis General Electric Company.

Electrical Manufacturers Offer Facilities to President for War Preparations.

Among the manufacturers who have offered their plants and service to the Government for war preparations and the maintenance of equipment, Secretary Daniels made public, on February 7, the following firms: Greenfield Tap and Die Corporation, Greenfield, Mass.; American Steam Gauge and Valve Company, Boston, Mass.; Bethlehem Steel Company, Bethlehem, Pa.; American Sheet and Tin Plate Company, Philadelphia, Pa.; American and British Manufacturing Company, Bridgeport, Ct.; National Tube Company, Pittsburgh, Pa.; American Steel and Wire Company, Chicago, Ill.; American Bridge Company, New York, N. Y.; Babcock & Wilcox Company, Bayonne, N. J.; General Electric company, Schenectady, N. Y.; Gould Storage Battery Company, Depew, N. Y.; Electric Boat Company, New London, Conn.; Lake Torpedo Boat Company, Bridgeport, Conn., and others.

New Type of Lighting Standard Used in Denver.

The accompanying illustration shows a lighting standard recently erected in front of the German-American Bank & Trust Company's building, in Denver, Colo. The purpose of the concern that erected the standard at its own expense was not only to beautify its own place of business, but also to encourage other business firms of Denver

Type of Ornamental Lighting Standard Being Adopted by Individual Business Firms of Denver.

to follow suit. It was pointed out that electric lighting standards in front of business houses, such as the one shown herewith, tended to add beauty to a city's business section. Thus business firms having the interest of their city at heart were appealed to and it is probable that the movement started by the bank people will bear fruit in the way of other installations of this character.

Proper Lighting by Legislation

An Analysis of Recent Legislation in Regard to Factory Lighting with Suggestions for an Improvement in Conditions Through the Channels of Co-operation

By C. E. CLEWELL,
Assistant Professor of Electrical Engineering, University of Pennsylvania.

AMONG the influences which have been at work in helping to improve the conditions of industrial lighting, probably the most important are the wider range in lamp sizes than formerly and the marked reduction in specific consumption of lamps coupled with a growing appreciation of the economic advantages of good light to the conduct of factory operations. It is not practical, however, in viewing this field, to consider merely the typical modern large factory, which has been constructed and is operated under exceptionally good management, where such items as good light and adequate heat and ventilation have all been thoroughly considered and adopted, but attention must be directed also to the older large plants where obsolete lighting equipment is still in service and where the possibilities of modern lamps and modern lighting methods are perhaps not fully appreciated. It is necessary, furthermore, to consider as well the thousands of smaller factories and shops where the principles of good management are not a part of the establishment, and where such features as lighting have not received attention.

Almost anyone can recall various cases of pernicious factory and shop lighting where even the most simple principles of good illumination are violated on every hand. For such instances, it is almost essential to provide regulations through the legislatures or the labor departments. From one viewpoint it may be contended that there are too many laws of this general nature and that to legislate further will act as a burden to the industries. On the other hand, if there are going to be legal enactments of this kind at any rate, a constructive way in which to view the situation may be to look with favor on all efforts which are made to assure that such enactments shall be drafted in the best possible form and that they shall be capable of accomplishing the purposes for which they are designed.

Again, and possibly of still further moment is the fact that factory-lighting legislation in the past has not only been meager, but that which has been in force, has, in general, been entirely too vague and scattered to make it of any practical value in improving existing conditions. To illustrate this fact, it is most interesting to examine the summary of requirements as to the lighting of factories in force in certain foreign countries on September 30, 1913, as published in the first report of the Departmental Committee on Lighting in Factories and Workshops in Great Britain, this summary containing provisions as found in the Austrian Empire, Belgium, Denmark, France, the German Empire, Holland, Italy, Norway, Sweden and the United States of America.

Quotations from the Requirements in France, Germany and Holland.

One or two quotations from this summary will indicate how difficult it is to design or to operate a lighting system with any degree of assurance that it meets requirements of this abstract nature. From the French requirements we find, among others, the following:

All indoor premises used for the carrying on of work, their annexes, and especially the passages and stairways, shall be adequately lighted.[1]

Portable lighting appliances must have a stable and solid base.

Every fixed and portable lighting appliance, whenever necessity arises, must be furnished with a glass chimney, a globe, wire netting or some other suitable arrangement for preventing the flame from coming into contact with inflammable material.[2]

Again, in the imperial requirements in the German Empire, applicable to all factories and workshops, the following is found:

The occupier is required to arrange and maintain the workrooms, plant, machinery and appliances, and to regulate the carrying on of work in such a way as to protect the persons employed against danger to life or health, so far as the nature of the work admits. In particular, care must be taken to provide adequate lighting.[3]

In several case, however, a specification of intensity is made; thus, in the Safety Law of 1895 in Holland, which was

[1] Decree of November 29th, 1004, Art. 5, par. v.
[2] Ibid., Art. 17, par. a.
[3] Gewerbeordnung für das Deutsche Reich, S. 120 a.

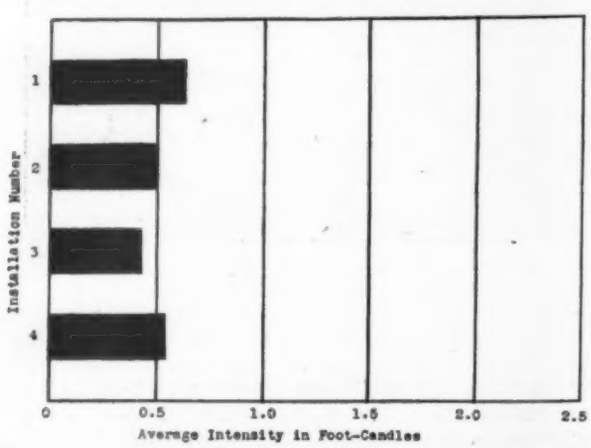


Fig. 1.—Average Illumination Values in Four Different Spaces Used for Cooling Tables and Laying-Out Floors in Steel Mills.

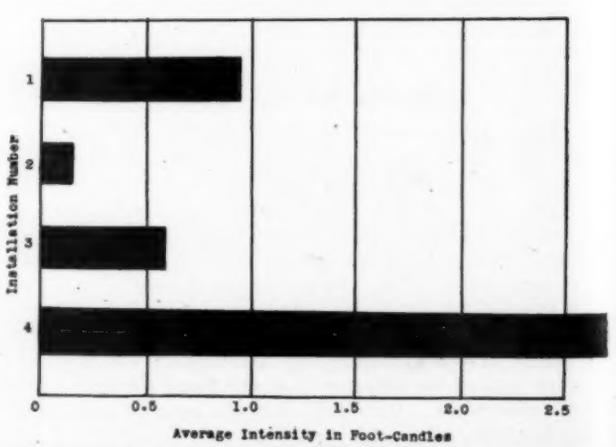


Fig. 2.—Average Illumination Values in Four Different Power Houses As Employed for the Engine Rooms in Each Case.

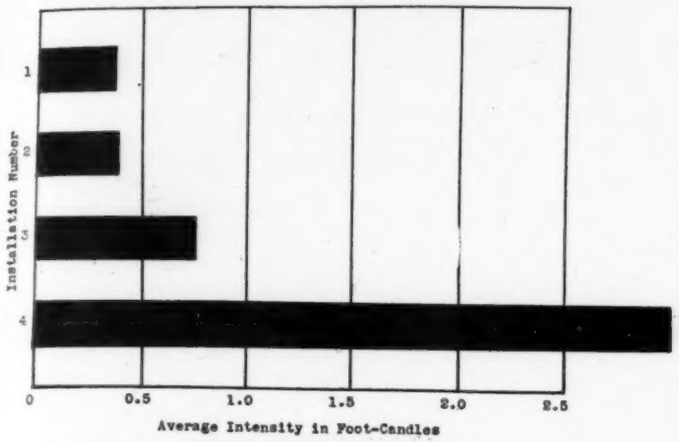


Fig. 3.—Average Illumination Values in Four Different Machine Shops.

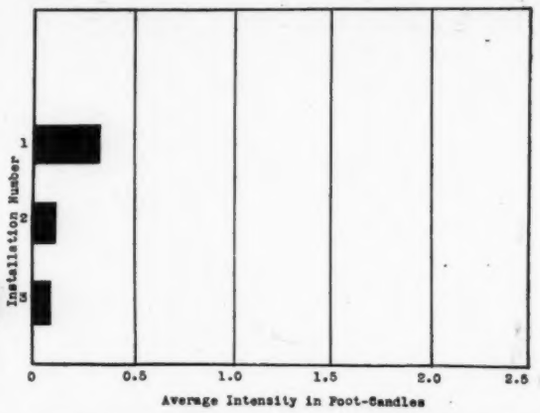


Fig. 4.—Average Illumination Values in Three Different Flanging Departments Connected With Steel Mills.

enacted so that regulations might be made regarding matters relating to the safety and health of persons employed in factories and workshops,[4] we find among the regulations made pursuant to this enactment, the following in regard to lighting, which specify intensity or the equivalent:

In places where the following processes are carried on: (a) Embroidery, (b) Working in diamonds and other precious stones, (c) Working in gold and silver, (d) Engraving on wood, (e) Manufacture of scientific instruments, (f) Composing, (g) Mechanical knitting, (h) Sewing, (i) Draughtsmanship, (k) Needlework, (l) Making and repairing of clocks and watches, the illumination must amount to an intensity of at least 15 normal candles at a distance of one meter (equivalent approximately to 1.5 foot-candles), and for places where other processes requiring a good light are carried on, the illumination must amount to an intensity of at least 10 normal candles at a distance of one meter (equivalent approximately to 1 foot-candle).[5]

A later enactment in Holland[6] contains the statement that:

A young person or a woman shall not be employed in a factory or workshop on (then follows a list of operations very similar to the one given above) unless the illumination on the place of work amounts to at least 30 Hefner units at a distance of one meter (equivalent to about three foot-candles); or any kind of work not included in this list which requires good light, unless the illumination on the place of work amounts to at least 20 Hefner units at a distance of one meter (equivalent to about 2 foot-candles).

Enactments in the United States.

Up to within the past two or three years, factory-lighting legislation in this country has perhaps been even more general and abstract than abroad. L. B. Marks, in his paper before the Philadelphia Section of Illuminating Enginering Society,[7] quotes from the findings of Prof. J. R. Commons, as follows:

There are only 11 states that make any mention of the subject of light in their general factory or labor laws, and in not one of these are the provisions sufficiently specific to render them of practical value.[8]

As an example, take the summary of the statues in the state of Pennsylvania prior to 1916[9] in regard to lighting requirements for factories, workrooms and halls, which includes three paragraphs as follows:

The hallways and stairways shall be promptly lighted at night.

Halls and stairways to be kept in a clean and sanitary condition and properly lighted.

Where employees, while engaged in work, are exposed to lead dusts, lead fumes or lead solutions, employer shall provide and maintain workrooms adequately lighted and ventilated.

The other regulations relating to lighting in the state of Pennsylvania,[10] which include county regulations, mines, miscellaneous, that is, boats, election rooms, etc., motion-picture theaters, schools, street lighting, tenements, theaters and townships, cover about 12 single-space typewritten pages and contain 123 regulations on lighting, but in no case is there any specification as to the intensity of the illumination to be provided, all these regulations being of a general nature, and, as pointed out by Mr. Marks, nearly all of this as well as other similar factory legislation has been directed to safety and only secondarily to illumination.

Channels for Improvement.

After looking over these older enactments which have been in effect in this country and abroad up to quite recently, several conclusions present themselves. First, that general requirements are almost if not totally without any exact interpretation. Neither the factory inspector nor the factory owner has any definite means for a judgment of whether or not an existing system is adequate. We may conclude, therefore, that a marked improvement in such legislation would be a definite classification of the various kinds of work in the industries, with recommended intensities for each case at the work. Second, that the regulations should emphasize the avoidance of those bad features in poorly designed systems which result in glare and consequent eye fatigue, eye strain, and other evils. Third, that ways and means should be outlined in such regulations by which the requirements can be definitely measured so that anyone concerned may know with assurance that the rules are being complied with.

Analysis of More Recent Legislation.

It is important at this point to consider the part taken by the Illuminating Engineering Society in assisting to remedy the older and unsatisfactory factory-lighting legislation. Through its Committee on Lighting Legislation, active co-operation is offered to legislative boards and others as part of the regular duties assigned to this committee, and in the special case of the New York State laws, as an example, which were put into effect on October

[4] Safety Law of July 20, 1895, (Statute No. 137), Art. 6.
[5] Royal Decree of December, 1896, (Statute No. 215), Art. 60.
[6] Royal Decree of December 6, 1911, (Statute No. 352), Art. 19.
[7] Trans. I. E. S., Vol. XI, No. 1, p. 47.
[8] From an investigation made several years ago.
[9] A new and important code became effective in Pennsylvania on June 1, 1916, containing marked improvements over the older regulations.
[10] Investigated and summarized several years ago.

1, 1913, the New York State Factory Investigating Commission in the preparation of the two laws for that state, solicited the assistance of the Illuminating Engineering Society in its work. While this Society has taken an attitude of co-operation in activities along these lines, its committee,

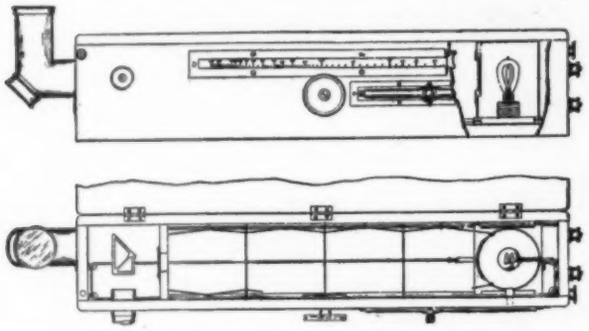


Fig. 5.—Side Elevation and Plan of Sharp-Millar Portable Photometer.

appointed for the purpose, was not fully equipped to do constructive work of this kind, until the preparation and publication of its Code of Lighting for Factories, Mills and Other Workplaces, which was issued in 1915.[11]

To better appreciate the advantages of this new Code and what it has already meant to several of the states in preparing factory-lighting regulations, it will be helpful to consider briefly the work which had been done in Wisconsin and in New York State prior to its publication. As pointed out above, factory-lighting legislation before the year 1914 had not only been meager, but, where it existed, its definitions have nearly always been abstract with little or no meaning as far as specific values were concerned.

One of the first signs of increasing attention to these questions was the issuance of the orders of the Industrial Commission of Wisconsin, on January 20, 1913. These orders, seven in number, contained the results of an apparent effort to remedy existing bad conditions by the specification of a certain quantity of light per unit floor area. Thus, the equivalent of not less than the light produced by a one-candlepower lamp hung 10 feet from the floor for each four square feet is specified for each place of employment in which hand or machine operations are performed, and where there is no gas or smoke in the air. This is characteristic of all the Wisconsin orders, which were evidently designed from the standpoint of efficiency as well as safety. Several notes are appended to the orders, which call attention to the advantages of reflectors and light ceilings.

An analysis of a basis like that used in Wisconsin leads

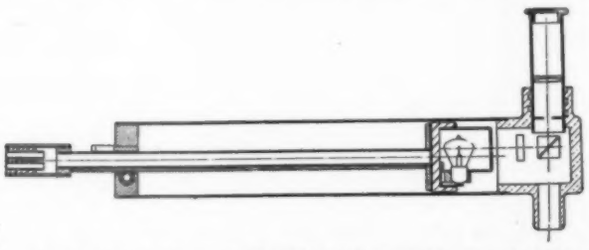


Fig. 6.—Sectional View of the Macbeth Portable Illuminometer.

to the following conclusion: A literal adherence to the orders proper, without regard to the appended notes, might, even with the best of intentions, lead to very poor results. Thus, one candlepower for each four square feet of floor area is equivalent to 0.25 candlepower per square foot. Tungsten lamps with a specific consumption of 1.25 watts per candle, if used, according to this requirement might be mounted 10 feet above the floor in such density as to result in $0.25 \times 1.25 = 0.31$ watts per square foot. It is a matter of common experience that many average factory lighting systems produce from two to three effective lumens per watt, that is to say, about two to three foot-candles for each watt per square foot installed; hence, 0.31 watts per square foot, even with the most efficient reflectors available, would hardly produce more than one foot-candle, and since the use of reflectors is not a concrete part of the order itself, the order might be complied with by mounting bare tungsten lamps in the same density as before, with a resulting intensity of possibly only 0.5 foot-candle or less.

Eye Strain from Insufficient Intensity and from Glare.

Mr. Marks, in his paper (Trans. for February 10, 1916, see p. 50, also previous footnote) points out that these general orders of the Wisconsin Commission, relating to the lighting of fine work, such as lathe work and the like, were apparently intended to correct the abuse of under illumination, because stress is placed on the requirement

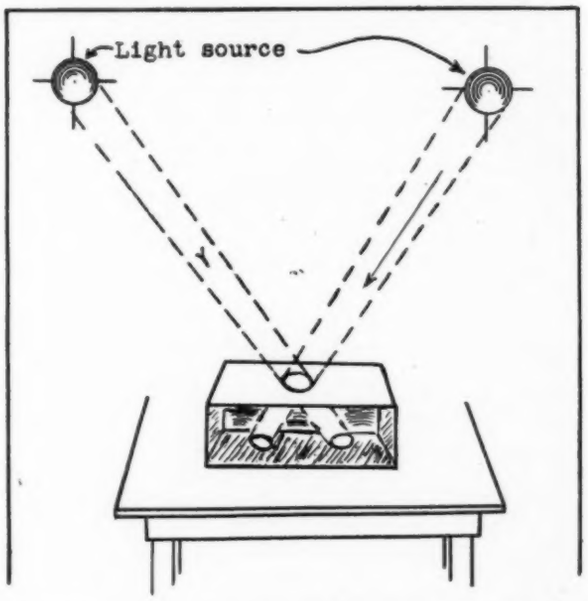


Fig. 7.—Luxometer. A Simple Device Which Must Be Used With Caution. Adapted only to the Comparing of Two Lamps With the Same Type of Reflectors.

that there must be "sufficient light provided in every case to avoid eye strain."

It is obvious that an equally bad effect on the eyes of workers may be produced by the glare from unduly brilliant light source. In other words, the Wisconsin orders emphasize the necessity for sufficient light, while the New York State laws, which became effective on October 1, 1913, go somewhat further by requiring adequacy of the light and also an arrangement which will "prevent unecessary strain on the vision or glare in the eyes of the workers."[12]

Need for Intensity Recommendations.

While each of these efforts to draft improved factory-lighting legislation in Wisconsin and in New York State is commendable, they each lack the important feature of specifications of intensity required at the point of work. As pointed out in the analysis of the Wisconsin orders above, a given value of candlepower per square foot may result in vastly different intensity values at the work, and it is a matter of common experience to find various in-

[11] Trans. I. E. S., Vol. X, Nov. 20, 1915, pp. 605-641.

[12] Trans. I. E. S., Vol. XI, No. 1, p. 50.

dustrial illumination systems with widely varying foot-candle constants per watt per square foot (lumens per watt). This is therefore an illustration of one of the weaknesses in the Wisconsin orders and also to some extent in the New York laws.

Referring again to the latter, we find that in New York

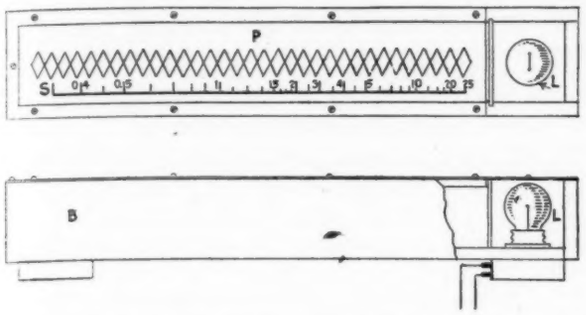


Fig. 8.—Top View and Sectional View of the Sharp Portable Illumination Tester. There Are No Movable Parts in the Operation of This Device.

the lighting laws call for proper and adequate light in workrooms during working hours, and here the inability to determine just what these terms mean, is met. As an analogy, suppose a trainman is instructed to keep the passenger cars of his train at a comfortable temperature on a winter's day. His duties require him to be on the platform at times, and in the coaches at others. When in the coaches the contrast between the outside temperature and that on the inside of the cars may make the inside temperatures seem warm to the trainman, but they actually may be very uncomfortable to the passengers. Tell the same trainman, on the other hand, to keep the thermometer in each coach at a given temperature, and his problem then becomes merely to regulate the heating system to a fixed specified temperature.

Similarly, due to the many physiological, psychological and other individual differences in the degree of satisfaction felt when observing or when working under a given intensity of artificial illumination, as well as the element of contrast, when passing from a bright to a less brightly lighted floor space, and the reverse, all go to render such terms as adequate and sufficient of very little or no meaning quantitatively.

To illustrate some of the differences which have been observed in actual installations, Figs. 1, 2, 3 and 4 have been prepared from illumination measurements made by the writer, each individual figure referring to a given class of work. The differences here shown have no relation primarily to legislation. They refer to industries located in a state where there was no definite specification of intensities in a legal way at the time the measurements were made. These figures show, however, that large differences may exist in the same class of work in various plants, because of a lack of standardization and rules for governing the minimum allowable intensity for given kinds of work would therefore seem most important.

More Recent Legislation.

Feeling the need of a fairly definite classification of types of factory work, the Illuminating Engineering Society has issued its factory-lighting code and in so doing has included as an important part of its contents a table of very general sub-divisions of work with minimum and recommended illumination intensities for each. This proposed code, issued in 1915, it will be noted, came several years after the efforts of Wisconsin and New York States. The I. E. S. code has, of course, emphasized furthermore those other vital factors in good lighting such as the avoidance of sharp contrasts, glare and the like, and it contains a fairly complete section of some 40 pages dealing with explanatory notes on the various phases of factory lighting.

With a definite code of this kind on hand, the Committee on Lighting Legislation has been better equipped than before to deal satisfactorily with departments of labor, and other bodies, when co-operation has been solicited in drafting out legislation of this kind, and this committee has had the compensation of seeing its code adopted, with very slight modifications, by the state of Pennsylvania, on June 1, 1916, and by the state of New Jersey, on August 1, 1916.

Practical Features.

Among other interesting features of these new state codes, is that of the following note applied to the rule on intensities for various classes of work. This foot note states, in part, that "for purposes of measurement a horizontal reference plane 30 inches above the floor is to be taken, and properly standardized portable photometer or illuminometer used." This note centers attention forcibly on the question of the practicability of attempting to use any of the portable photometers now available in the work of inspecting factory-lighting systems and lends special interest to the various instruments of this kind now on the market.

Figs. 5, 6, 7 and 8 show, in diagram form, and for ready comparison, several types. The one in Fig. 8 is, perhaps, of particular interest at the present time because it represents an effort to reduce the instrument to the utmost simplicity and to a low cost, thus tending to encourage the wider use of illumination measuring instruments. It would seem that an inexpensive, fairly accurate and easily handled instrument of this type may meet quite a need in the work of this general nature.

One ruling of the new Pennsylvania code has been the subject of some discussion. This refers to Rule V, entitled "Emergency Lighting," which reads:

"Emergency lighting shall be provided in all work space, aisles, stairways, passageways and exists; such lights shall be so arranged as to insure their reliable operation when

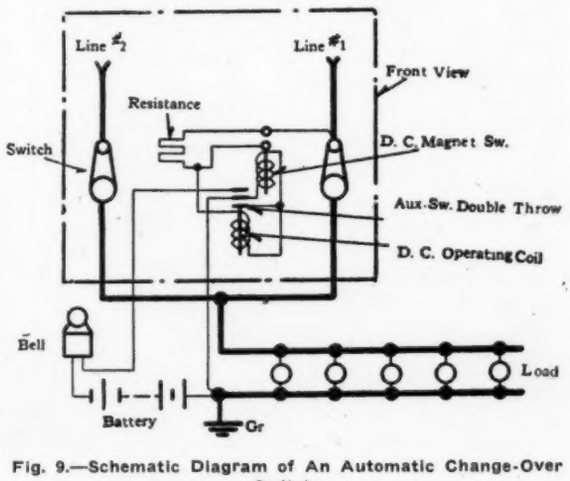


Fig. 9.—Schematic Diagram of An Automatic Change-Over Switch.

through accident or other cause the regular lighting is extinguished."

This ruling is apparently drafted as a safeguard against accident in case of disorder or panic which might follow the failure of all the artificial lighting in a given room or section of the factory. In the I. E. S. Code, Article XI covers this feature under the heading "Auxiliary Lighting," as follows:

"Auxiliary lighting should be provided in all large work spaces, such lamps to be in operation simultaneously with the regular lighting system, so as to be available in case

the latter should become temporarily deranged." An explanatory note in the I. E. S. Code explains further the purpose of this suggested ruling, as follows:[12]

The auxiliary system of lighting called for in Article XI of the Code, is a safety first precaution which is insisted upon in a large proportion of the 1,200 buildings coming under the control of the Bureau of Water Supply, Gas and Electricity in New York City, particularly such buildings as are occupied by large numbers of people. The same precaution is now observed by the Bell Telephone Company's offices fairly generally throughout the country, also by a large number of private manufacturers and by local ordinances compelling all types of amusement places to take this precaution.

It has been suggested by one or two manufacturers in Pennsylvania that a literal enforcement of Rule V in the Pennsylvania Code might work a hardship on certain plants. The intent of this ruling is obviously good, but as far as can be learned, no exact interpretation as to how to comply with Rule V has as yet resulted since the code became effective on June 1, 1916.

Rule V of the New Jersey Code is also concerned with emergency lighting and its wording is identical with that of the Pennsylvania code except for the omission of the comma after the word "space" in line 1 (see above). This would appear to limit the required installation of emergency lamps to aisles, stairways, passageways and exits, in New Jersey factories, while the wording of Rule V of the Pennsylvania code apparently includes work spaces as well. As just indicated, while the wording of Rule V in each of the codes is practically the same, the New Jersey code carries this particular ruling a step further by appending a note, which reads as follows:

"Emergency lighting systems may be installed in various

Fig. 10.—Night View of a Substation Equipped With an Auxiliary System of Illumination.

ways, and specifications of all such systems shall be submitted in duplicate to the Bureau of Electrical Equipment of this Department for preliminary approval, before being installed. All such lighting shall be (if electric on separate circuits) entirely independent of the regular lighting equipment and shall take energy from a source acceptable to the Department of Labor and which is not liable to failure, through accident or other cause, to the regular lighting system."

[12] See page 14 of the I. E. S. Code referred to in previous foot note.

This explanatory note would seem to put this ruling on a more satisfactory working basis for the manufacturer. It is of interest to note that this general proposition of auxiliary lighting is employed with evident success in a number of places. For example, Fig. 10 shows a night view of a substation which is equipped with two separate and distinct lighting systems. If, for any reason, one of these fails, the other is thrown on automatically. Fig. 9 shows a wiring diagram of a change-over switch which has been designed to accomplish this purpose.

One of the most striking views of this general question of factory lighting legislation is contained in a discussion by L. T. Bryant, Commissioner of Labor, in the state of New Jersey, following the paper of L. B. Marks, on "Lighting Legislation," referred to previously. This discussion is so much to the point and sets forth so clearly the viewpoint of the head of a state department which is making notable efforts to remedy industrial conditions, that it is quoted in part in the following paragraphs:

"I have often said the American people seem to need something spectacular to attract their attention. In 1910 there occurred in High Street, Newark, N. J., the first of the series of large fires in the State of New Jersey. Some 25 girls were burned under the most harrowing circumstances. Their bodies were washed around in the gutter by the water from the firemen's hose. The next day in the city of Newark there were a hundred thousand people to see the remains of this fire. It was almost as much as a factory inspector's life was worth to walk on the street. The following year, according to statistics in the Department of Labor, the three items of slipping ladders, belts and elevators caused a loss of within one or two as many people as this fire and there was not one word of protest raised in the entire state. I have often said that a person who has been burned will generally get a head line in the paper; one who has fallen down an elevator shaft will get only two or three lines in some part of the paper and one who unfortunately contracts and succumbs to an occupational disease, such as lead poisoning, will get an obituary, if there is money enough to pay for it.

"I was very much pleased with the remarks Mr. Marks made about the employees' compensation schedule, not including injury to the eyes from bad light. Why shouldn't a workman be expected to have proper light, the same as proper air to breathe? If he is forced to work in an improperly lighted workroom or where the light is shining in his face, as I have seen in the factories, why isn't that just as much injury, by reason of his occupation, as having his finger cut off, for instance; it may be very much more serious to him, it may be a very much greater handicap in his occupation during future life. What surprises me is the absolute lack of intelligence on the part of so many good manufactures in the use of light. They do not know anything about it. I have often explained to the factory inspectors that the mere use of a piece of paper to screen lights from the eyes would often constitute splendid work. I believe that this matter should be taken up in the form of scientific standards and that these standards should be expressed in language which the ordinary layman will understand."

The conviction back of the foregoing words is evidenced by the fact that six months later the State of New Jersey put into effect its new code of factory lighting, thus being the second state in the Union to adopt regulations which call for specified intensities of illumination at the work.

Company Inaugurates Luncheon Conferences.—The first of a series of luncheon conferences between the executive officers and department heads of W. S. Barstow & Company, Incorporated, 50 Pine Street, New York City, was held at the Lawyers' Club in that city, January 22. A similar "get-together" gathering will be held each month.

COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

SELLING ELECTRIC RANGES IN COMPETITION WITH NATURAL GAS.

Six Months' Range Campaign Demonstrates to the Satisfaction of Both the Central Station and Customer Practicability of Electric Cooking.

Following "the trend of the times," the Northwestern Electric Service Company, Erie, Pa., on May 15, 1916, entered upon its first campaign and experience in the sale of electric ranges.

A rate of three cents per kilowatt-hour for cooking and heating, with a minimum charge of $1 per month, subject to a discount of five per cent for prompt payment, was established and the sales department authorized to get results. With a qualm of conscience and many misgivings, an order was placed for 12 ranges, and a plan of procedure outlined.

APPROACHED Name 7/8-16 Address	Commodity	Got Attention	Got Interested	Got Chance to Close	Secured Order
1 W. R. Murphy Rd	Range	1	1	0	0
2 Walter Amond ..	..	1	1	1	1
3 A. W. Purdue ..	..	1	0	0	0
4 J. W. Mose ..	..	1	1	0	0
5 W. L. Munson ..	..	1	0	0	0
6 J. B. Long ..	..	1	1	1	1
7 A. D. Gilmore ..	..	1	1	0	0
8 L. F. Betts ..	..	1	1	1	0
9 A. B. Miller ..	..	1	1	1	1
10					
11					
12		9	7	4	3
13					
14					
15					
16					
17					
18					
19					
20					
Total					
Per Cent					

Fig. 1.—Score Card Kept by Each Salesman for Recording Results of Range Calls.

The Northwestern company serves a population of 18,850 people, located in one city of 15,000 and six smaller towns. The city of 15,000 population is served with natural gas at the very reasonable rate of 30 cents per thousand cubic feet, so that the sales effort, as a starter, was devoted almost entirely to the smaller towns, which were using, coal, wood, oil and gasoline with which to cook.

Mrs. A. B. Miller, #777 N. Main St., Cambridge Springs, Pa. — May 18, 1916 — Electric Range.

Fig. 2.—Prospect Card Filled Out in the Office and Given to Salesmen. The Result of Each Call is Noted in the Blank Space.

Upon receipt of four ranges from the manufacturer a systematic campaign was started. Two salesmen were delegated to proceed in a follow-up on a form letter, which was mailed to 20 customers each day. This letter spoke of the expereince of other central stations with ranges, and offered a free trial of 30 days of any range to which the customer might take a fancy. In the follow-up work, two cards were used, which have proven very effective.

Fig. 1 shows the score card, which the salesmen used. The salesmen were required to keep a record of each approach made, showing for each one whether or not he succeeded in getting the prospect's attention; whether he succeeded in getting her interested in the range after her attention was secured; whether he got a chance to put in his close on the prospect; and whether he secured the order. This card helped the salesman to note his weak points, so that he could strengthen his argument at this particular point of the interview.

Fig. 2 shows a plain white card, three by five inches, on which was typewritten the prospect's name, address, date and appliance to be sold. Ten of these cards were mailed to each salesman each day, and the same day that the form letters were mailed to corresponding prospects. As the prospects were called upon, salesmen noted results and future prospects on card No. 2 and also showed his record on the score card No. 1. Card No. 1 he retained and with the sales manager picked out the flaws in his arguments. Card No. 2, when filled in, was returned to the tickler file in the sales office.

The four ranges on hand were sold in the first week's effort and a good many more promised, but as other central stations experienced at that time, delivery was slow and material hard to get. Six more ranges were ordered immediately and the company is now merely selling electric cooking and recommending the best range that the customer can afford to buy.

The company's proposition to the customer is, any range

selected to be sold at list price and installed free in the home, with $5 down and the balance in 12 equal monthly payments. Karl W. Wilks, sales manager of the company, in summarizing the campaign, states: "Results were so good that we have invaded our 'city of 30-cent gas,' and the year 1917 will prove a big year in electric cooking alone, for our present range owners have been requested for letters of recommendation and have, with very few exceptions, complied and are all 'boosters.'

"April 1, 1917, a big demonstration will be put on in every town we serve and no fear is felt as to the results for electric cooking is here to stay."

ADVERTISING THAT BRINGS RESULTS USED IN DENVER.

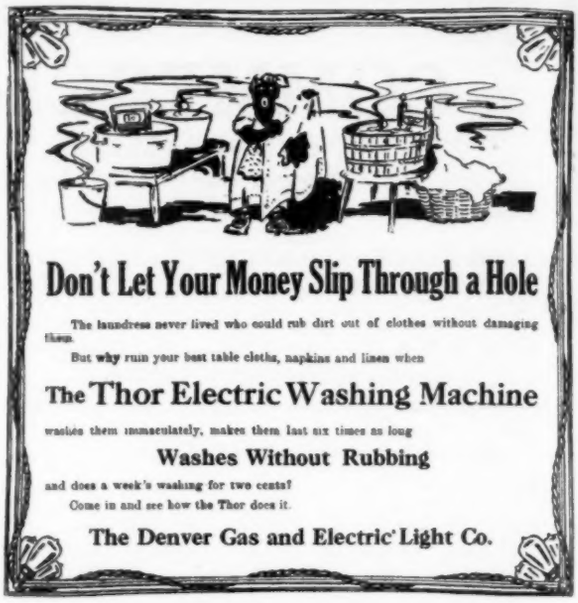
Denver Gas & Electric Light Company's Campaign Featuring Various Appliances is Improving Sales.

By Ira R. Alexander.

During the past several weeks the Denver Gas & Electric Light Company, of Denver, Colo., has been conducting an advertising campaign in the newspapers that has attracted a good deal of attention. Not only that, but it has been a big business-bringer. The advertising by the Denver company can well be taken as a suggestion for dealers in electrical merchandise as to the proper way of going about their advertising. The accompanying illustrations show three typical examples.

The advertisements used in the Gas & Electric Light Company's campaign are not large, but they are arranged in a way to command notice. In the first place, the border used speaks of the subject. The main feature of this border is a light wire connected with bulbs in each corner of the advertisement.

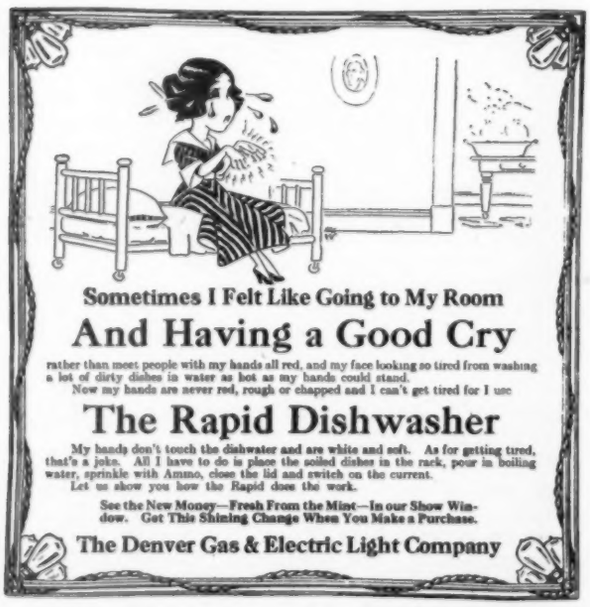
The reading matter of the advertisements is written with a view of creating interest in electrical merchandise. This is a point a dealer should bear in mind when preparing his copy. If a dealer merely states that he has such and such electrical articles for sale and gives the price at which they are offered for sale he does not create a desire in the minds of the people for what he has in his store in the way of electrical merchandise. That sort of advertising merely appeals to those people that have already been thinking of purchasing some electrical article. That is the class of people that read the advertisement and since they have already given the matter a good deal of thought, the advertisement merely informs them where they can purchase what they want.


Don't Let Your Money Slip Through a Hole
The laundress never lived who could rub dirt out of clothes without damaging them.
But why ruin your best table cloths, napkins and linen when
The Thor Electric Washing Machine
washes them immaculately, makes them last six times as long
Washes Without Rubbing
and does a week's washing for two cents?
Come in and see how the Thor does it.
The Denver Gas and Electric Light Co.

A Particularly Productive Washing-Machine Advertisement Used in Denver Campaign.

On the other hand, the advertising, such as the Denver Gas & Electric Light Company is doing, creates a desire for electrical merchandise in the minds of people that have given it little or no thought before they see the advertisement. Of course, that kind of advertising also attracts the attention of the people mentioned in the foregoing paragraph. Nowhere in the advertisements are prices mentioned. They merely point out the value of different electrical articles in the home—in fact, the advertisements tend to educate the people to the value of doing things in the home the "electrical way."

One-half of each advertisement is taken up by a line drawing which illustrates the reading matter occupying the other portion of the advertisement. This fact makes the advertisement attractive and calls attention to it.


Sometimes I Felt Like Going to My Room
And Having a Good Cry
rather than meet people with my hands all red, and my face looking so tired from washing a lot of dirty dishes in water as hot as my hands could stand.
Now my hands are never red, rough or chapped and I can't get tired for I use
The Rapid Dishwasher
My hands don't touch the dishwater and are white and soft. As for getting tired, that's a joke. All I have to do is place the soiled dishes in the rack, pour in boiling water, sprinkle with Ammo, close the lid and switch on the current.
Let us show you how the Rapid does the work.
See the New Money—Fresh From the Mint—In our Show Window. Get This Shining Change When You Make a Purchase.
The Denver Gas & Electric Light Company

Now Bill Can Invite His Friends In After the Theater
He has always wanted to bring the "gang" home and give them a little feed after the show, but could never give them anything hot.
This Hotpoint Chafing Dish
will afford him and all his friends endless delight. It looks stunning and it will last.
Drop in the Hotpoint Booth at our showrooms when you are in doubt as to what "he" would like.
You will find just what "he," "she" and "they" appreciate among the Electrical Christmas Gifts at our showrooms.
Open This Evening
THE DENVER GAS AND ELECTRIC LIGHT COMPANY

Two Typical Advertisements of the Denver Gas & Electric Light Company Showing How Various Appliances Are Featured in Each Advertisement.

Another point brought out in the advertising of the Denver concern is that it is best to change the copy each day. An advertisement that is never changed, but appears day after day in the newspapers is equivalent to publishing the same news story in every issue. On the first day it would be read, but when it appeared the following day a person seeing it would say: "I read that in yesterday's paper." And after seeing it the second time the paper would be thrown aside. Thus the advice to dealers is change your advertisements each day, and it is best to feature different articles of electrical merchandise in different advertisements. One day the Denver Gas & Electric Light Company comes out with an advertisement featuring an electric washing machine; the next an electric chafing dish, and so on down the line.

Thus the following results are brought about by the advertising described in this article. People see the advertisements as they appear each day in the local newspapers, and as each one is different from the proceeding one it is read. In these advertisements the people are told of the value of the different electrical articles in the home, and they become interested—first in the advertisements themselves and then in the electrical articles which they tell about. Next they go to the store and see the articles and direct results are achieved.

The dealer that does not advertise, or when he does make use of the advertising columns of his newspapers merely states that he has for sale certain electrical articles and is offering them at such and such prices, merely gets people into his store that have already made up their minds to purchase; while the dealer that goes ahead and conducts an advertising campaign that has back of it the purpose of creating a desire for electrical articles in the home is reaching out and enlarging his field and is paving the way to greatly increased sales.

Suppose, for example, on Monday, "wash day," a dealer should come out in the evening paper with an advertisement telling about the value of an electric washing machine in the home, and in doing so he makes it plain how easy it is to do the washing with this sort of a machine. Wouldn't the lady of the house who was tired out with doing her washing the old way be likely to read that advertisement?

Now on the other hand, suppose the dealer merely stated that he had such and such an electric washing machine for sale, and did not tell of its labor-saving possibilities. The lady of the house would not be nearly so likely to read the advertisement, as she probably already knows there are such things as electric washers, but she has not been told how much easier it makes her work. Thus when a dealer does that kind of advertising, backing it up by arranging his advertisements in an attractive manner and changing that arrangement often enough so that they will retain their drawing power, he is paving the way for increased business—business that is sure to result.

The Denver Gas & Electric Light Company is meeting with success with good interest-creating advertisements and every other electrical merchandise dealer can do the same.

Boston Edison Company Secures Contract for City Pumping.

After protracted discussion and offers from both the gas and electric companies in Boston, the Boston Edison Company has been given the contract for supplying power for pumping at a high-pressure station to be built in the North End. In addition, the Boston Elevated Railway Company will have emergency connection. The Edison company will receive a minimum guarantee price of $15,000 per year, and the Elevated will receive its compensation from the Edison Company, rather than from the city.

Advertising the Advantages of Industrial Electric Heating in St. Louis.

The Union Electric Light & Power Company of St. Louis is running a very convincing advertisement in the daily papers, reproduced in the accompanying illustration, in which attention is drawn to the all-around desirability and economy of electric service for industrial heating processes. As will be noted, attention is called to the principal advantages and the service of an industrial heating engineer is offered without cost to prospective users of this service.

Electric Heat for Industrial Processes
The application of electricity in all forms of industrial heating is rapidly displacing the older and dangerous methods.
Of all fuels either liquid, solid or gaseous, electricity is the most desirable. Besides being the most modern, electricity really meets all the demands of convenience, cleanliness and safety which are so important in the industrial heating field to-day.
Electric Heat is Clean, there being no smoke or ashes.
Electric Heat is Safe, being neither inflammable nor explosive.
Electric Heat is Odorless and Smokeless since there are no burnt gases.
At our low rates for electricity, electric heat is economical when compared with other methods of heating.
While being capable of producing temperatures higher than that produced by any other method, Electric Heat can be so closely regulated and controlled that any desired degree of temperature can be secured and maintained. This makes Electricity specially applicable in heating processes such as for:
METAL MELTING
LIQUID HEATING
OIL TEMPERING BATHS
JAPANNING OVENS
DRYING OVENS
CRUCIBLE FURNACES
Our Industrial Heating Engineer is always at your service and will be glad to confer with you as to how electric heat can be profitably and conveniently applied to meet your requirements.
Our Service for Electric Light, Heat and Power is at your disposal, 24 hours a day
Union Electric Light and Power Co.
"THE ELECTRIC CO."
12th AND LOCUST STREETS
4912 Delmar 3626 N. Grand 3012 S. Grand

The Initial Advertisement of a Series Which the Union Electric Light & Power Company Is Publishing to Secure Industrial Electric Heating Business.

This form of advertising is not only of great educational benefit to the interested public but marks, as well, a progressive policy on the part of the utility company to popularize and extend electric service in the industrial field.

SAYS HYDROELECTRIC LINES SHOULD BE CONNECTED WITH LOCAL LIGHTING SYSTEMS.

Commissioner Schaff of Massachusetts Commission Believes Continuity Would Be Insured and Expense Reduced.

An interesting comment of Commissioner Schaff, of the Massachusetts Gas and Electric Light Commission, that transmission lines constructed by hydroelectric companies to serve large territory should be required to tie in with local lighting companies into whose territory they penetrate, deserves attention. The commissioner argued that not only would the community of service of the local central stations be improved and insured, but also that the amount of money invested in electric utilities would be kept at a minimum by such inter-relations. The co-operation and exchange of product by hydroelectric and steam companies would seem to be mutually beneficial.

ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

PROPOSAL FOR A NEW CLASSIFICATION OF EDISON PLUG FUSES.

Simple Designs Submitted Before the Western Association of Electrical Inspectors to Distinguish 0-10-Ampere Fuses from 12-30-Ampere Fuses.

By B. Berssenbrugge.*

The following rules of the National Electrical Code pertain to the installation of branch circuits: 8*c*, 23*d* (first, fourth, fifth and sixth paragraphs), 23*e* (third paragraph), 25*a* (first paragraph). These rules clearly limit to 660 watts any two-wire branch circuit to which are connected lamp sockets, heating appliances or other translating devices or a combination of devices, each of which is rated at 660 watts or less. These rules also limit the rated capacity of the fuses to protect each conductor of these two-wire branch circuits to 10 amperes.

While Rule 8 mentions potentials up to 3,500 volts and Rule 23 is classified under "all voltages," it is standard practice to limit the rated capacity of the fuses to protect the conductors of two-wire branch circuits to 3 to 5 amperes for 220 volts and 6 to 10 amperes for 110 volts.

Central-station practice is to transmit energy at a high potential to distribution points where it is transformed to low voltage suitable for connection to lamp sockets or other devices at the receiving end. The most common system of low-voltage distribution is the three-wire, 125-250-volt system with grounded neutral. In an installation on this system the two or three wires, depending upon the load connected, are run to a distribution center in the building with the proper insertion of the service switch with fuses and the meter. At this distribution point the two-wire branch circuits are tapped from the mains by means of cutout panels, two-branch cutouts, or single-branch cutouts, or sub-feeders are run to other distributing centers to distribute the energy through two-wire branch circuits. The two-wire branches of this type of installation are nearly all circuits of 660 watts or less and covered by the above rules of the Code and each wire of these circuits must be protected by a fuse of the maximum rated capacity of 10 amperes. While some of the panelboards are designed for cartridge-type fuses, the majority of panelboards and double or single-branch cutouts are of the standard Edison plug type, as this type of cutout and fuse is cheaper in first cost and renewal of fuses.

Under the classification of cutouts given in Rule 68 of the National Electrical Code, the Edison plug-type cutout is rated from 0-30 amperes, thus making possible the insertion of a fuse of from 1 to 30 amperes rated capacity in a two-wire branch circuit connected to such cutout.

What is the field experience of the electrical inspector in regard to the fuse protection of the 660-watt two-wire branch circuits? It is safe to say that upon inspection of existing installations it will be found that in 75 per cent of these installations some of the branch circuits are overfused or protected by fuses of more than 10-ampere capacity. Upon investigation the inspector learns that due to some unknown trouble the 6 or 10-ampere fuse had blown. A new 6 or 10-ampere fuse was bought and when inserted in the circuit was blown again. Next a 15-ampere fuse was inserted with the same result and then a fuse is bought of a still higher capacity until the fuse holds; this may be of a capacity as high as 30 amperes. Now, when this 30-ampere fuse holds, a defective socket or some other device connected to such circuit and causing the original 6 or 10-ampere fuse to blow, is burned out and upon discovery replaced by a new one, or the ground may be burned off and the circuit cleared, but in either case the last fuse inserted in such circuit is left in and the circuit overfused to from 150 to 300 per cent, thereby constituting a constant fire hazard.

Of course, in some cases when even a 30-ampere fuse is blown the cutout contacts are bridged by copper, but it is not the intention herein to protect against such malpractice. Some central stations or public utilities send out trouble men, and while these men know the rules, they insert fuses from 15 to 30 amperes in such branch circuits because they want to give service to the customer and have not the time to investigate and remove the cause of the blowing of the fuse.

Above it was mentioned that for unknown reasons the fuses blow, but we know that there is also a known cause, which is the overloading due to electrical household appliances.

If we take the trouble to inquire of the different dealers in electrical appliances as to their experiences in selling plug fuses, they will tell us something like the following story of what takes place nearly every day.

Customer: "I want some fuses."

Dealer: "What kind and what capacity?"

Customer: "I don't know. Here is the one I took out."

Dealer: "Ten-ampere plug fuse. How many do you want?"

Customer: "Give me two like that."

Customer goes out of the store and comes back later.

Customer: "Say those fuses were no good. They were not strong enough. Give me some stronger ones."

Dealer: "Do you know that the law prohibits you to install larger capacity fuses?"

Customer: "What do I care for the law? Give me some larger fuses. What do you care what I do as long as I pay you for what I buy?"

Dealer: "All right. If you want larger fuses you can buy them, but you better have your wiring looked over or you will get into trouble."

Customer: "I suppose you want to get a couple of dollars out of me. Just sell me the fuses. That is all."

Also, there is the janitor in office and apartment buildings who wants to give the tenants service and cares not if he overfuses a circuit as long as the lights burn and the boss does not receive any complaints; or the engineer or oiler in the industrial plant acting in the same way; or even a wireman who knows better has sometimes been found to overfuse a circuit and to send in a bill for removing the cause of the trouble.

Unquestionably, the overfusing of branch circuits constitutes fire hazard, but in addition to that it may cause serious burns to persons who want to turn a key on a socket which has a "short," or when holding an extension cord while pressing the two wires together at places where the cord insulation is poor or worn off, thus causing a "short" in the circuit. The only way to eliminate these hazards is to make a new classification of the Edison plug cutout and fuses or develop some new type of cutout and fuses.

This new classification for Edison plug or other type of cutouts and fuses is proposed to be

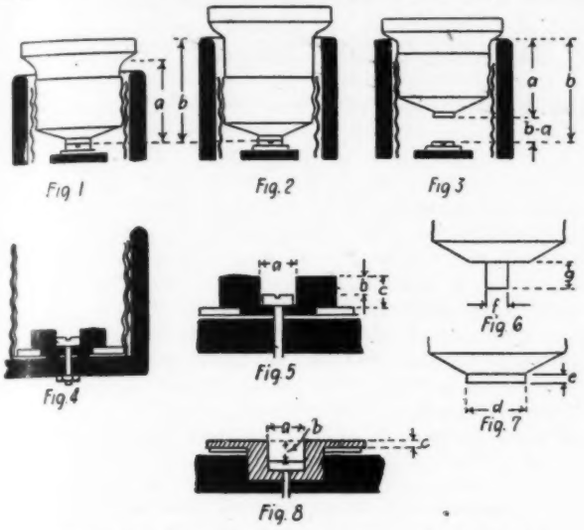
0 to 10 amperes and

12 to 30 amperes,

and to conform to rule 68*e* of the National Electrical Code.

*Electrical inspector, city of Milwaukee, Wis.

At first thought it seems that such a new classification of cutouts and fuses calls for a radical change in the design of cutouts and fuses predominating at present, but several methods suggest themselves, which, while they fulfill the requirements,



Suggested Simple Designs for Reclassification of Edison Plug Fuses.

do not call for any great change of the present design of the Edison plug-type cutout.

One method, see Figs. 1, 2 and 3, calls for an increased height of the porcelain wall partly surrounding the screw shell of the 0 to 10-ampere cutout and a corresponding increase in length of the 0-10-ampere plug-type fuse (see Fig. 2), the 12-30-ampere plug fuse and cutout to be same as the present construction. Thus by screwing a 12-30-ampere plug fuse into a 0-10-ampere cutout the bottom center contact of the fuse will come short of making contact with the center contact of the cutout by a distance *b-a* (see Fig. 3), while the 0-10-ampere plug fuse may be used in either the smaller or larger current rating cutout, thereby fusing properly the smaller rated cutout or underfusing the larger rated cutout. If it is feared that the porcelain may be broken off of the 0-10-ampere cutout in order to install the shorter high-rated plug fuse, the screw shell may be lengthened corresponding to the increased height of porcelain wall so as to make it more difficult to accomplish this.

Another method which may be considered calls for a different shape of insulating washer separating and insulating the center contact from the screw-shell contact in the cutout and a corresponding bottom contact on the plug fuse (see Figs. 4, 5 and 6) for the 0-10-ampere current rating, while the 12-30-ampere rated cutout is left as at present, with a bottom plug contact shaped as in Fig. 7. The bottom plug contact of the 12-30-ampere plug fuse (see Fig. 7) must be of such dimensions that when *d* is smaller than *a* in Fig. 5, *e* must be less than *b* in Fig. 5, but when *d* is larger than *a*, the thickness *e* may be such as to satisfactorily carry the current. The bottom contact of the 0-10-ampere plug (see Fig. 6) must be of such dimensions that *f* is smaller than *a* of Fig. 5, and *g* is larger than *b* of Fig. 5. By countersinking the bushing-shaped insulating washer in the porcelain base the dimension *c* (see Fig. 8) may be made very small, thus not requiring a higher screw shell for the 0-10-ampere cutouts, due to the increase in length of bottom contact of the 0-10-ampere plug. This method has the advantage that it does not allow the "shorting" of the cutout contacts by means of pennies or metal washers or by inserting a screw or nail through the opening of the screw shell.

Unfortunately it seems that any change in construction of cutouts and fuses as demanded above, calls for a change in the smaller rating cutouts and fuses of which the larger number are daily being installed and in use.

While in all the rules of the National Electrical Code quoted above the load on two-wire branch circuits is limited to 660 watts, which soon will be the only link connecting the Code with the fast disappearing carbon-filament lamp, there seems to be no reason to increase this load to 1,000 watts, as the only limitation seems to be the 10-ampere fuse considered necessary to protect the No. 18 fixture wire; and even this capacity of this fuse may be increased if the elimination of the insulating joint in the future demands a better insulation of fixture wire.

Whatever may be the limits as to load or capacity, at present or in the future, of the two-wire branch circuit, the capacity of the fuse should never exceed the capacity of the No. 14 wire used for these circuits, which is 15 amperes.

It is up to the manufacturers, standardization committees and Underwriters' Laboratories to design, manufacture or approve a cutout and fuse for use only on two-wire branch circuits and limited as to capacity to conform with the rules of the National Electrical Code covering such branch circuits.

Suggested Safety Rules for Electrical Equipment in Coal Mines.

The Bureau of Mines, Washington, D. C., has compiled a series of safety rules for installing and using electrical equipment in bituminous coal mines. They have been compiled by H. H. Clark and C. M. Means of the Bureau of Mines, and are published as Technical Paper No. 138.

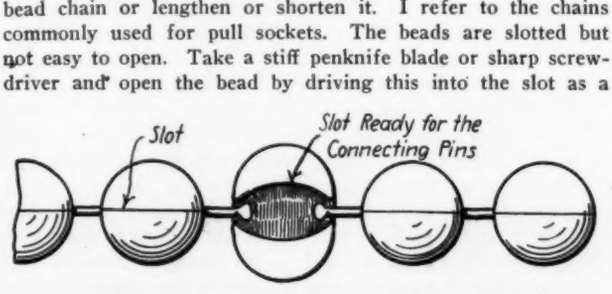
The suggested rules are prefaced by a series of definitions so as to make the meaning of terms used in the rules perfectly clear. The rules themselves are 169 in number and are divided into five divisions, of which the first includes general rules; the second relates to surface and underground stations; the third to machines and apparatus; the fourth to circuits and conductors; and the fifth to miscellaneous electrical equipment used in and about mines.

The object of drafting these rules is to increase the safety of the use of electrical equipment in mines, which themselves require exceptional care on account of inherent hazards existing, particularly in the case of gaseous mines. It is hoped that the use of these rules will be helpful in reducing the number of accidents, and in urging the use of well chosen equipment and the adoption of uniform and efficient methods of construction, installation and maintenance. The Bureau of Mines has prepared these rules with great care and intends them to be constructive and not restrictive; in other words, they are intended to assist and not to hinder, and should be considered a suggested guide to the accomplishment of satisfactory results.

Repairing or Adjusting Bead Chains.

By Walter Morris.

Many electricians, I find, do not know how to repair a broken bead chain or lengthen or shorten it. I refer to the chains commonly used for pull sockets. The beads are slotted but not easy to open. Take a stiff penknife blade or sharp screwdriver and open the bead by driving this into the slot as a



Changing Length of Socket Bead Chains.

wedge. By using a more blunt screwdriver widen it just enough to insert the connecting pins on the adjoining beads. Next, with a pair of gas pliers close up the slot to its original position.

"Overhead"—A Profit-Eating Parasite

A Forceful Article on the Importance to the Electrical Contractor of Taking Proper Account of "Overhead" or Operating Expense and the Need for Education on the Subject

By GEORGE W. HILL

FOR many years there has been a tendency to inject into the contracting business an element of chance. It seems that we are all more or less inclined to take a chance, and while the gambling instinct is much stronger in some than in others, yet all of us have a tendency to gamble more or less, in one form or another. It seems to be human nature to play a little faro, either at the tables of some modern Monto Carlo or in some form in our everyday business dealings.

Of late years, however, there has been a decided tendency on the part of those who believe that electrical contracting is a business based on science rather than a trade or gambling game to eliminate as much of the gambling element as possible. Great strides have been made. Many new ideas have been advanced, some of which have had sufficient merit to stand the test, but much theory has been dropped by the wayside to make room for hard, cold facts and practical ideas. Among the most commendable and notable have been job cost accounting, quantity survey, unit costs, etc., all of which have earned a just place in the business. These forward movements have been fostered in a large measure by the different associations in the industry that have for their ultimate purpose the uplifting and upbuilding of their respective branches of the business.

"Overhead" an Important but Perplexing Factor in Business.

Great stress has been laid upon "overhead expense," due to the fact that this is without a doubt the most perplexing of all elements entering into any business, and I may say the least understood by many. We are able with some degree of accuracy to make a quantity survey. The number of different articles entering into a job may be accurately counted. The number of feet of pipe or wire may be determined by the use of a scale rule and a little arithmetic, but when it comes to the operating expense to be added to each individual job we seem to lack a proper rule.

If some ingenious Yankee would invent a rule or instrument so finely constructed and adjusted that we might apply it to our plans and specifications, and by it could determine somewhat accurately the amount to be added to the cost of productive labor and material in order to determine our whole cost, so that we might set an intelligent selling price, no one could state how great a blessing this would be. Thousands, I believe even millions, of dollars would be saved to our craft. The great trouble with the whole thing is that the men who fail in business through not being able to set an intelligent selling price lose money which is often very much in excess of their own.

This profit-eating parasite "overhead" seems to be lurking in every crack and crevice of our business, and often in unmeasurable quantities and in unsuspected places. It is in our stock rooms. It lies around in the corners of our workshops in the form of wasted material. It will be found to be among the goods on the shelf in various forms. It comes to work in the morning with tardy workmen or in time wasted in getting out material while men stand around waiting to go to work. It often follows them around all day in the form of non-productive labor, waste material, etc. It eats dinner with the workmen in lost time in quitting and resuming work. It is often the companion of the superintendent or foreman in the form of inefficient methods. It is nothing uncommon to find this animal "overhead" perched upon the desk of the manager, keeping his company while he chats with unimportant callers, or manifesting itself in the form of lack of executive ability and lost motion in the business. It makes love to the stenographer and flirts with the bookkeeper in the form of bad accounts. It will be found in one form or another in every branch of the business, eating away on the profits of the business, and while it cannot be entirely eliminated it can be kept under control.

Authorities Arousing Business Men on Subject.

So alarming has become the practice of simply buying goods at one price and selling them at a higher price in the belief that money was being made by the merchants of the country, that our Federal Trade Commission has viewed it with much concern. Many articles have been published by the commissioners and spread broadcast over the country, in an effort to awaken business men to their duty to themselves, their competitors and customers and thus to better conditions among all classes of business men.

E. N. Hurley, lately vice-chairman of the Commission, said, "Teach the business man to know his costs so that he may be able to set an intelligent selling price." Why does Mr. Hurley say "An intelligent selling price?" Simply because of the fact that careful investigation has revealed a most alarming condition prevailing among our business firms, namely, lack of intelligence in the establishment and setting of prices. Why are they not marking their goods correctly? There is but one answer—a lack of some simple yet comprehensive method of determining the operating or overhead expense. It certainly cannot be that they are unable to ascertain the cost of articles at the manufacturer's or the wholesaler's place of business, or that they are unable to ascertain delivery costs, for these items are easily understood and determined, but it is when these goods are unloaded into their places of business that they become inoculated with this germ "overhead" and are surrounded with an uncertain cost. It is when they begin to take their just proportion of the rent, heat, light, handling costs, fire insurance, clerk hire, management expense, public liability insurance, automobile insurance and expense, advertising, stationery, and a large number of other smaller and less important items of expense, but all of which go to make up the whole operating expense. Then it is found that this is an uncertain cost which must be added to all other costs before the merchant is able to set an "intelligent selling price." An intelligent selling price should be a price which includes all costs and a reasonable profit.

How many contractors and other merchants do we find who are getting intelligent selling prices? According to the ideas of our Federal Trade Commission and the best business men of the country, many of us are "kidding" ourselves along in business by simply setting an arbitrary overhead-expense percentage, based either upon a good or poor guess. How many of these concerns do we find that are actually in possession of the money or other tangible

assets equivalent to the percentages of profit added over and above all costs? Too often we find ourselves looking in vain for the money to pay for automobiles which we purchased on contemplated profits, which are often eaten up by this animal "overhead."

Common Ignorance of Subject Necessitates Harping On It.

There are many who will no doubt say, "Is Hill harping again on that overhead-expense proposition?" To those who know their overhead expense and are setting an intelligent selling price this article should remind them to keep religiously at it, while to those who are not certain this article should act as a light house which warns drifting vessels from rock-bound coasts, and if you do not know your operating expense and do not keep comprehensive records, you are surely aimlessly drifting and should be on the lookout for lights that mark the treacherous coasts and warn you that you are dangerously near shore.

I was invited to speak upon the subject of cost accounting before a state convention of an industrial association and while I was putting in my hardest knocks on overhead a member of the convention arose and interrupted me. He asked the chairman if the latter could explain why a man was hired to come there and tell them how to run their business and to harp away on that old threadbare subject of overhead. "Sit down, John," "Sit down" was heard from all quarters, but the member persisted in standing up. The chairman seemed somewhat embarrassed and undertook an apology to me for the interruption. I said: "No, let him stand up. I will ask him one simple question pertaining to this subject. If he answers the question correctly, I will sit down, but if he fails I will then insist upon him taking his seat and remain seated during the remainder of my talk." I said to him, 'Brother, to what account do you charge freight and draying.'" The answer came clear and promptly, "overhead." I said to him "You are wrong. Will you please be seated and listen attentively to what I may have to say on this subject. It may do you a considerable amount of good." And he did as I bade him amid much applause.

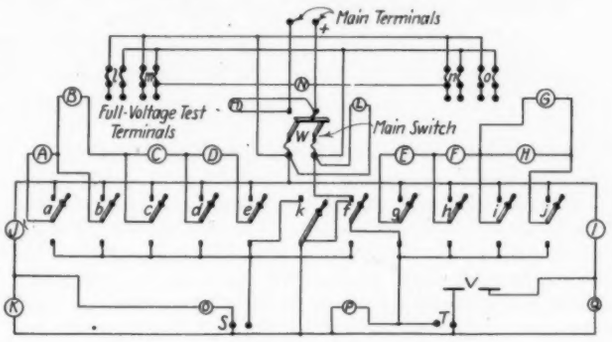
If you are right, I will sit down and never mention "overhead" again, but if you are wrong I shall harp on it until it is understood and taken care of.

A Convenient and Unique Test Panel.

By Verne W. Miller.

In the accompanying diagram is shown the wiring of a convenient and practically foolproof test panel which was designed and installed by the writer in the testing laboratory of a school. A number of similar panels have since been installed by him with success in the testing rooms of factories and other places. The object of this board is to provide means for supplying almost any desired current by using a number of lamps grouped in various ways as resistances to regulate the current. Several sets of terminals for full-voltage tests are also provided; also receptacles for full-voltage and adjustable-current tests, likewise clips for testing fuses and lamps.

The main switch *W* controls the entire panel. Connected above it is a pilot lamp *M* which indicates when current is on the panel. Below the main fuses is connected a pilot lamp *L* to indicate whether the main fuses are all right. The pilot lamps may be of five candlepower and preferably of candelabra base. *A, B, C, D, E, F, G, H, I* and *J* are standard-base lamp receptacles or weatherproof sockets fastened into the slate or marbel panel with sulphur; each of these receptacles has a lamp in it of any desired wattage. *K* is a similar receptacle into which a standard-base lamp may be inserted for testing. *Q* is a receptacle with candelabra base or a set of test clips into which a lamp with candelabra base may be inserted for testing. *N, O* and *P* are receptacles or weatherproof sockets for inserting attachment plugs. *V* is a set of right-angle pieces of copper or brass for testing cartridge fuses. *S* and *T* are test terminals to which may be connected test circuits whose current is to be adjusted.



Wiring Diagram of Test Panel.

The switches *a, b, c, d, e, f, g, h, i* and *j* are single-pole double-throw knife switches that are used for grouping the lamps in various combinations to get adjustment of the current on the test circuits; *k* is a single-pole single-throw knife switch for short-circuiting the test terminals and sockets.

Fuses *l, m, n* and *o* are preferably of three-ampere cartridge type, arranged with terminals directly below them for full-voltage tests. All the wiring of the panel is done on the back of it. The panel is 0.75 inch thick and 18 by 28 inches in size.

The uses of the panel are probably obvious. However, a few combinations may be cited as follows: With the main switch closed, switch *e* down and switch *a* up, the current will take the following path: +, W, through the appliance secured at the terminals *S, e, D, C, B, A, a, W* and —, thereby inserting the sum of the resistances of the lamps *A, B, C* and *D* in series with the appliance at terminals *S*.

With switch *W* closed, switches *a, c, e, g* and *i* up, and switches *b, d, f, h* and *j* down, the current will pass from + through *W* and the appliance connected at *S*, returning through the eight parallel paths including the lamps *A, B, C, D, E, F, G, H* and then back through *W*, thereby inserting in series with the appliance at terminals *S* a resistance which consists of these eight lamps in parallel, or, in other words, gives the maximum current possible when using these lamps as resistances. If these lamps are 16-candlepower carbon lamps, the current flowing through the appliance at test terminals *S* will then be about 4 amperes; if 32-candlepower carbon lamps were used, this current would be about 8 amperes.

A good many other combinations are possible by proper grouping of the switches from *a* to *j*, inclusive. Lamps with standard bases are tested in series with a lamp *J* at receptacle *K*. Lamps with candelabra bases are tested at receptacle *Q* in series with lamp *I*. Fuses are tested at the clips *V* in series with the lamp *I*. Other uses for the board will evidently be apparent to the reader.

Among the Contractors.

F. F. Hairider, formerly of Ludington, Mich., is establishing an electrical supply and contracting business in Bowling Green, Ky.

The Electric Construction Company, Jersey City, N. J., has been awarded a contract for electric wiring installation for the new pier of the Pennsylvania Railroad, Greenville section, Jersey City.

The Sacramento Electrical Supply Company, Sacramento, Cal., bid $3,565 for placing six electroliers at the entrances of the Court House, and this bid has been accepted.

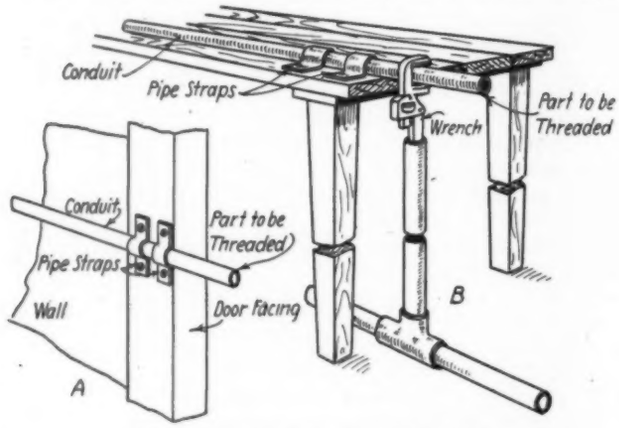
DOLLAR WIRING KINKS

All readers are invited to contribute to this department. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must be new and bright. A dollar will be sent to the contributor upon publication.

Improvised Pipe Vise for Threading Conduit.

In the smaller wiring jobs it does not pay to haul a heavy work bench with pipe vise to the premises, especially where there is only a very small amount of conduit work to be done. In this case, I have found that a pipe vise can usually be improvised without much trouble. In the accompanying sketch I have shown two ways for doing this. The best way is to make use of any old table or bench; I have even used a stair railing or a large heavy packing box at times.

Place the conduit to be threaded on top and near the edge of the table, bench or railing, holding it by a pair of pipe



Improvised Pipe Vise for Conduit Work.

straps; if it is a very long pipe, an extra strap should be put near the left end of the pipe. The latter is prevented from turning by being held by a pipe wrench, which has a hickey or any convenient piece of pipe slipped over its handle; at the bottom end of this pipe is an ordinary "T" fitting, through which a piece of pipe rod is slipped and placed on the floor. By standing on this floor pipe with one foot, the pipe wrench, and therefore the conduit, is kept from turning, so that the threading or cutting can be easily done with both hands. If there is no table, bench, railing or heavy box handy, the pipe can be held against the wall by means of a pair of pipe straps, as shown in the sketch at the left. The pipe wrench and extension handle are used as before.

Robert Patterson.

A Good Snake for Fishing in Attics and Method of Using Same.

In many ready-built residences, where there is no scuttle hole cut to get into the attic, one can usually find a place to cut one in the ceiling of a closet. But in some houses luck does not favor us, so to get into the attic a hole will have to be cut in one of the rooms. Some landlords do not approve of this, on account of unsightly appearance, and some even suggest that they "do not need the up stairs wired, anyway."

One method of overcoming this difficulty, in many instances, is to fish loom. Some partitions (where the switches and wall brackets are to go) are open at the top, but some are not. When the latter is the case, I find that by cutting a piece of wall paper from the corner and chiseling a notch in the plaster, lath, and the cap of the partition, it is an easy matter to get the wire down the partition. To remove the wall paper successfully, I cut with a sharp knife around a design, if any. If there is none at the corner, I cut in straight lines about six inches square. It is then removed by moistening with water. When the wires and loom are in place, the notches are filled up with plaster, on which when dry the paper is pasted back with library paste.

To fish the loomed wire, I use the following tool and method: Use the steel tape of an old tape line, of which the marks are revived. On the starting end of the tape a hole is punched, and this is alternately immersed in molten solder and allowed to cool until a ball is formed, which is dressed down to one-half inch in diameter with a file.

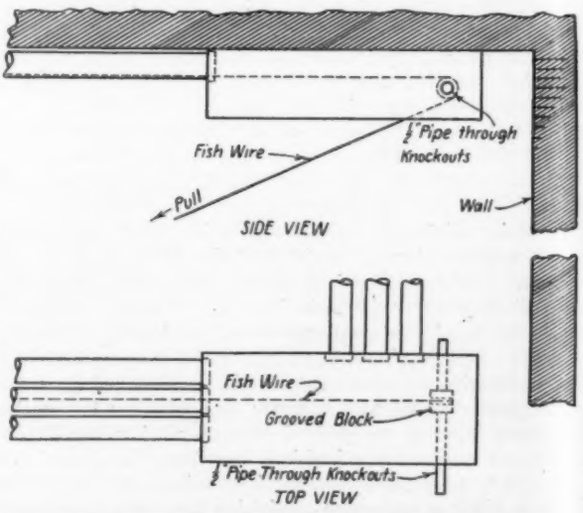
It is an easy matter to worm the snake between beams and other obstructions in the attic. It takes just a little patience and common sense. When you have fished the snake out of the other outlet, it is pulled out to the required length of the loom, then the slack is pulled back to the first outlet, and the measurement noted on the tape. I usually allow about eight inches more than the indicated amount. Two pieces of loom are cut accordingly. The wire is then shoved through one piece and then through the other. About eight inches of wire is left at the latter end, 16 inches in the center and eight inches at the other end. The wire is then skinned about two inches in the center and twisted above the ball on the tape to secure a good hold. The loomed wire is then easily pulled into place. Be sure to kink or fasten the wire over the end of the loom so the wire will not pull out of the loom. It is necessary for two men to do this work, one to fish for the snake and the other to sound out the snake by shaking same.

H. L. Baer.

Pulling Cables Into Confined Pull Box.

Having to place a large pull box on a ceiling close to a wall, and foreseeing the difficulty that would be encountered in pulling in the heavy wires, due to the proximity of the wall, I had two extra one-half-inch knockouts punched into the box, opposite each other as shown in the accompanying sketches. When the box was up, and the wires were to be pulled in, a piece of one-half-inch conduit was slipped through these knockouts. On this half-inch pipe a grooved round wooden block was slipped first so that the wire would not be pulled around too small a radius. As shown in the diagram the wire was first pulled around this pulley so that the direction of the applied force was away from the wall. In this way the circuit cables were easily pulled into place.

R. R. Knoerr.



Method of Pulling Cables Into Confined Pull Box.

DEALER AND STOREKEEPER

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Storekeeping for the Dealer in Electrical Appliances

SELLING GOODS BY MEANS OF ATTRACTIVE WINDOWS.

Cincinnati Electrical Dealers Demonstrate the Value of an Attractive Display.

An ordinary display of electrical merchandise is of little interest to the average passer-by. His attention must first be gained by the beauty, the harmony, or the novelty of the display. Once his interest is aroused it is up to the merchant to see that signs—brief, and to the point—give him information regarding the objects displayed, and a concise argument on the advantages of electricity in the home.

Cincinnati has long been known as a progressive electrical city, and its dealers in electrical merchandise and supplies have striven in friendly rivalry to see who would be foremost in attracting the public. The result of their efforts, noted during a recent visit to that city, may offer suggestions to merchants in other cities who have gotten into a rut, and wish to start the new year with increased sales.

One of the best and most practical exhibits, since it first caught the attention and then drove home the moral, was arranged by the Beltzhoover Electrical Company. The window was fitted up to represent a suburban street, with little street lamps, tiny fir trees, and three toy houses, each about a yard high. All were of modern architecture, and seemingly of equal value, but cards in front told a different tale. In front of the first was the sign: "THIS HOME IS LIGHTED BY OIL LAMPS; Grandma doesn't read any more in the evening; the children wear glasses; mother had much additional work keeping the oily, smoky lamps in order."

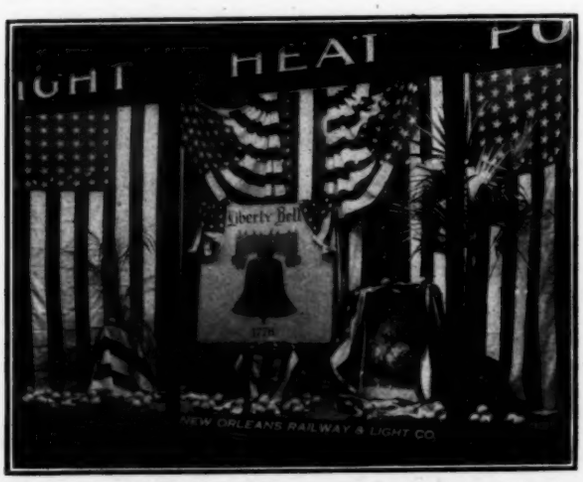
The second little house was labeled: "THIS HOME IS LIGHTED BY GAS; the pipes leak; the mantles break; the light is unsatisfactory," while the last had a card adorned with a poster of the modern Aladdin: "THIS HOME IS LIGHTED BY ELECTRICITY, the modern illuminant; which is clean, safe, convenient and cheerful. Electric light is now within the reach of everyone. Give us an order now to wire your house; special rates and terms to suit."

The children enjoyed the toy village, and brought it at once to the notice of their parents; and the brief, pointed cards at once drove home the advantage of electricity.

Another firm that made somewhat similar comparisons in lighting effects was the E. L. Jones Electric Company. A series of four booths was shown. Each was about two feet square and deep, lined with black cloth. In the first was shown a tallow candle in a mahogany holder, and just beneath the booth a card: "In Your Great Grand Father's Day." Next was an old fashioned kerosene lamp: "In Your Grandfather's Day." The third offering was a tiny incandescent bulb: "In Your Father's Time;" while lastly was the clear and powerful light of the present day "The Best and Most Economical of All." A long panel by the side of the last made the pertinent inquiry: "Can you afford to live in the past? You owe it to yourself and your children to keep abreast of the times. Your father and forefathers used the best light they knew. Do the same. Wire your house for electricity."

Another noteworthy window was that of the Union Gas & Electric Company, which had a large cabinet, divided into six sections, alternate ones being lined with red and blue cloth. The first showed lights and fixtures for the kitchen, with the card: "Kitchen wired, also light in cellar, and meter installed, only $20.86." Other cabinets gave the lighting of the various other rooms with the price including fixtures.

Suggestions for Holiday Window Displays



Observance of National holidays by a suitable window trim is one of the little details which helps very much to place the local electrical dealer in the front rank of progressive merchants. In view of the present international situation patriotic windows are timely and are bound to attract attention and the approaching celebrations of Lincoln's and Washington's birthdays are additional incentives for giving some thought to your window this month. The two views shown are exceedingly appropriate at this time and are very inexpensive to arrange.

Business Hints for the Electrical Dealer

Keeping Advertising Copy Up to Date—Opportunities for Electrical Business in Office Buildings—Maintenance of Electric Signs—Moving Displays Are the Best Sales-Makers—The Electric Talking Machine

By G. D. CRAIN, Jr.

THE best arguments in favor of a product or appliance are developed by actual experience. The electrical dealer who uses electrical goods in his own home, as well as in his office and store, is fortified to talk about them, and can present more convincing information regarding them, than he could possibly do if he relied entirely on the "selling talk" supplied by the manufacturer.

The customer is inclined to discount the usual claims made for any article, no matter how meritorious. And oftentimes the dealer who does not know of his own knowledge what an appliance will do is luke-warm in backing up the claims made by the manufacturer.

Use of Appliances by Salesmen.

Consequently, when he has tested it out himself, and knows exactly what it will do, he is able to enthuse over it in a fashion which converts the prospect, and makes sales work easier. In fact, when one can substitute the first for the third person in any kind of argument, it sounds 100 per cent more convincing, and makes just about that many more sales.

A few months ago the writer was in an electrical shop where Christmas toys were being featured. One salesman in particular was noticeable for the vim and energy with which he was demonstrating toys and selling them to those for whom they were demonstrated. He was asked a little later why he was so interested in that particular department.

"Why, I have a little boy of my own," he explained, smiling, "and we have installed most of these toys at our house for his benefit. The result is that I know just what each one of them will do, am familiar with how to rig up the wiring, etc., and of course can tell customers more about each toy than if I had never made them work myself."

His success was easy to explain, for it was based on familiarity born of personal experience. And what is true of toys is just as true of any other kind of electrical appliance. If your wife is not using an electric percolator, iron, vacuum cleaner, washing machine or other appliances which you are trying to sell down at the store, you can't hope to make a very convincing presentation of the merits of these several machines. It is just as though a life insurance salesman came into your store and tried to sell you a policy, while admitting that he didn't carry a cent's worth of insurance on his own life.

Inconsistency is a mighty big handicap for anybody in the merchandising business to carry, and the electrical dealer should realize it.

About the Traveling Man.

The electrical dealer was just saying goodby to the traveling man when the writer dropped in. The parting was friendly, even cordial and was accompanied by every evidence that relations had developed beyond the purely commercial stage.

"Nice chap," remarked the dealer. "I think a lot of him, and give him a good deal of business. His line, of course, is all right, and the way he represents his house is all right, too.

"He has made himself solid with me, though, by the way he tries to help out. Nearly every time he drops in he has an idea or two, picked up somewhere on the road, that he turns over to me. Sometimes it is a scheme for displaying some appliances; sometimes it is a sales stunt, and sometimes it is a message about a new product, which has just come on the market and looks like a winner. Jim is interested in seeing that I get all the news of this character, and that is why the 'Welcome' sign is hanging out whenever he comes this way. Really, I couldn't afford to do anything but spend as much time with him as he will let me."

That was a rather enthusiastic send-off for Jim, wasn't it?

Another angle on the traveling man's relations with the dealer was furnished by a remark dropped by a successful Ohio Valley dealer not very long ago.

"So-and-so, representing one of the big houses, has just about queered himself with me," he said. "What do you think he did? Sent me a Christmas present!

"He knows that I do all the buying for my concern, and he has been soliciting me right along, and has been trying to get me to tie up exclusively with his house. Well, he made a mistake when he thought that he could promote his interests by giving me a present.

"In fact, I shall tell him the next time he comes around that Christmas presents are unnecessary. We have no personal relations, have never developed the social side of life together, and it was more or less an evidence of bad taste and poor business judgment to send anything to me. I should have preferred a Christmas card, which would have expressed his sentiments without implying an obligation on my part."

Here, apparently, are two ways of approaching the dealer: one, by means of real service, which has succeeded; the other, by adopting a patronizing attitude, which failed. The inference, which should be drawn by most traveling men without any trouble, seems to be fairly clear.

Boosting Price and Quality.

Some remarks were made in this department not long ago to the effect that high price, which is usually an index of good quality, can often be made a talking point instead of something to be apologized for.

Recently this was emphasized by some advertising of John Wanamaker, the Philadelphia department store magnate. The fact that it was a department store and not an electrical dealer who brought out the point does not make it less suggestive to those in the latter line of business.

In the advertisement referred to, a vacuum cleaner which was to be sold at considerably more than the usual price was offered, and the "ad" started out by saying that customers might suppose that the price was too high, because it was so much more than ordinarily asked for cleaners of that type.

"But this cleaner is built just a little better than anything else we have ever seen," the "ad" continued, and then it took up the various construction features, including the fan, brush, etc., and demonstrated that there was real quality in the machine.

The announcement closed with a definite recommendation of the store in favor of this cleaner, which was pronounced the best of the fan type the concern ever put in stock.

Of course, the name of Wanamaker counts for a good deal in Philadelphia, where this advertisement was published, and good will helps considerably to put over a high-priced article. But any dealer who has something which possesses unusual quality, and therefore must be sold at a higher price than others, will be pleasantly surprised, if he puts the loud pedal on this feature, to see how many people will respond to this mode of appeal.

Use Your Display Devices.

Many of the manufacturers of electrical appliances furnish

store display devices, and in numerous cases these are electrically illuminated. It is doubly good business to make use of advertising material of this character, not only because a good display device will help to sell the goods, and thus make more business and more profits for the dealer, but also because it is a standing advertising for the use of electricity for advertising purposes.

The writer has recently given special attention to the use of electrical store advertising material of various kinds, and has been interested to note that drug stores use more, as a rule, than any other class of retail establishments. This may be because the drug store is getting to be so much of a novelty emporium, and aggressive advertising is required for novelties. It is also because the great variety of goods carried by the druggist demands special display to get attention for the several classes. But whatever the reason, the fact remains that as a user of electrical display apparatus, including signs and devices of other kinds, all having a selling feature, the drug store is far ahead of the field.

This is more or less of a reflection on the electrical dealer, who ought to take the lead in this respect. If his store is a good example of how to use electrically operated sales helps, he will not only profit through the assistance he receives in disposing of his own goods, but he will impress others with their value, and thus make a contribution to the cause of electricity at large. He will evidence the fact that he knows his business, and applies all of its forces in his own work, as well as recommends them for the use of other people.

IS A RETAIL DEPARTMENT PROFITABLE TO THE ELECTRICAL CONTRACTOR?

A Paper Read by Charles A. Pierson Before the Electrical Contractors' Association of State of Missouri at Kansas City, January 20.

It is rather hard to judge the question from the Kansas City standpoint, because the Kansas City situation is not a favorable one for the contractor. The retail electrical business has been stunted by unfavorable conditions. There are three departments which may be classed as retail departments by the electrical contractor, namely, the lamp sales, the appliance sales, and small repair business.

Lamp Sales.

The electrical contractor should enjoy the natural returns from lamp installations. Whenever a large or small installation is completed the contractor should get the order for incandescent lamps along with the drop cords or fixtures. This is a natural part of his business. Lamps should be distributed far and wide through the medium of the electrical contractor or dealer, because electric lamps are a commodity which are needed at all hours and usually needed very badly. But by the present system the contractor is practically eliminated from the field; first by a system of contracts on a consignment basis depending on quantity used during the year, and next by leeway given to central stations which permits them to distribute lamps at any prices and on any terms which may suit their convenience or further their ends.

The result of this lamp-sales agreement has been all that the genius who formulated the plan could have expected. The lamp sales have gravitated to the central station. There are some places in the country where the electrical contractors and jobbers have been able to exert enough influence to get equitable conditions into effect.

It can be conservatively estimated that the electrical contractors of Kansas City alone are losing about $50,000 per year in lamp sales. The lamp-sales department should be profitable on its natural basis. The department is not profitable if constricted as it is.

Appliance Sales.

There are five or six contractors in Kansas City who are in favorable locations for brisk retail business in appliances. Do they undertake it? Look at their windows. The window is the only connecting link between the contractor's retail department and the public. You will find that the average window display consists of a few motors of nondescript type, probably an immense knife switch (slow moving or overstock), a few knobs, tubes and cutouts, which constitutes an array in which the passing public is not in the least interested, but serves only to inform them that the contractor is there and in the electrical business. An attractive sign would do this much better and cheaper.

Why does not the contractor show some interest in this branch of the business? In the first place it has not been profitable to him. His help is selected primarily with the object in view of taking care of a contracting business without any consideration for the retail sales. He usually has a good bookkeeper, a good stock boy and probably a girl to care of the general routine office work. If anyone wants a fuse plug or socket or other article, it is there for him and is handed out to him in a "don't care" sort of a way.

Most of the contractors have made attempts at conducting a retail business, with the result in many cases of an overstock of fly-specked and dusty toasters, percolators, irons and vibrators. So the inclination is not to invest in goods easily damaged. There is more incentive for investment in wiring materials, which are far more lucrative in return than the appliances are. A paltry $100 or $200 gross business in appliances does not offer any attraction.

The natural result has been that the central stations have considered that in order to get current-consuming devices on their lines they would have to attend to the distribution of the appliances themselves. They have gone about this in the usual way of the large corporations, to obtain the desired object in the quickest possible way, to get the devices on the lines and consuming current in the shortest possible time. The contractor cannot meet such competition. He cannot extend time payments on small amounts. He cannot advertise his product as cheaply. The consumer does not come to his office for any other purpose. They go to the central-station office to pay their bills and there see the array of devices. The result is that attempts at co-operation fall on deaf ears now. Central stations are marketing their goods in quantities which the contractor cannot hope to equal. They are obtaining better prices on account of quantities and on account of their connection in some cases with the manufacturers.

Appliance sales are profitable under the ideal conditions of good sales rooms, efficient help employed for the purpose, good location, and service which extends back of the guarantee of the manufacturer. There are numerous cases where the customer is entitled to more and a broader guarantee than the manufacturer gives them. The retailer must attend to this phase of the case and in some cases even take a loss. He can afford to do this, if he has enough business to warrant it.

Small Repairs.

Every contractor has a certain amount of small repair business, such as electric irons and cords, extension cords, small motors, toasters and all small goods. This should not be overlooked. If fostered, it not only adds to the income but often leads to bigger things. Many a small repair customer becomes a big customer some day. This part of the business can be carried on no matter what your location and it yields a good percentage of profit.

Any business should be built up from the bottom and every part of its foundation firmly established. Attention to details of any portion will yield results and the results will be in exact proportion to the effort expended, be it in the retail department or in the contracting department.

NEW APPLIANCES

A Review of the Latest Developments and Information Respecting Electrical and Kindred Mechanical Appliances

Medium-Base Reflector Sockets.

The development of gas-filled lamps up to 300 watts and over, has brought about the development of a socket of the medium-base size, designed to meet the special conditions created by such lamps.

The reflector socket recently brought out by the Arrow Electric Company, Hartford, Conn., is built along the same lines as the regular mogul porcelain socket, except that it is for medium-base lamps.

It is built up of heavy porcelain and is of heavy construction throughout. Screw shells and binding posts are

Medium-Base Reflector Socket.

reinforced. An asbestos gasket is used between the porcelains and a rubber gasket below the cap.

All connections are made from the front of the socket, and the sealing compound is a special preparation known as Arrowax, which hardens with the application of heat.

The socket is made with three-eighths and one-half-inch metal caps, and three-eighths and one-half-inch iron yokes. It is designed to take a standard shade holder, and is particularly adapted for reflectors and fixtures using medium-base type C lamps.

New McGill Lamp Guards.

To the very extensive assortment of its well known lamp guards the McGill Manufacturing Company, Valparaiso, Ind., has added a line of wall guards especially suited for exterior and other installations where safety is a most important feature for stationary as well as portable lamps. Thus these guards can be used for docks, warehouses, railroad platforms, theaters, etc. These guards are exceptionally strong, the wire ribs being made of Bessemer steel. The rings and base are stamped and thoroughly copper-plated.

Fig. 1 shows what is known as the Crescent Style A guard, which has key-hole slots in the base ring to make them easy to attach and detach and eliminates danger of knocking the guard off by accident. This guard fits any standard three-inch round outlet box; a similar type is made for four-inch outlet boxes.

Fig. 1.

Fig. 2.

Fig. 3.

In Fig. 2 is shown a Style D guard combined with outlet-box cover. The latter forms a convenient and secure means of attaching the guard. This guard has a trap or cover equipped with a key locking arrangement that prevents theft of the lamp, as well as breakage.

A style E guard is shown in Fig. 3. This is made especially for use with Crouse-Hinds J and K Condulets. A modified form of it is provided with locking arrangement similar to that shown in Fig. 2. The guards shown are a few typical ones of the new line.

New Cable-Ring Crimper.

The growing use of lead-covered cable for aerial telephone circuits is bringing about a need for more reliable methods of suspending such cables from the usual messenger or suspension strand. A tool that has been particularly designed to facilitate the rapid installation of such cables, when heavy galvanized cable rings are used for support from the messenger, is shown in the accompanying illustration. This crimping tool is composed of only two parts, made of crucible tool steel, hammer-forged and machined and fitted so as to interlock together perfectly. Each jaw of the tool has a crimping knife, which is securely held in place by means of two set screws. The handles of the tool are bowed so as to give abundant clearance in handling any style of cable ring.

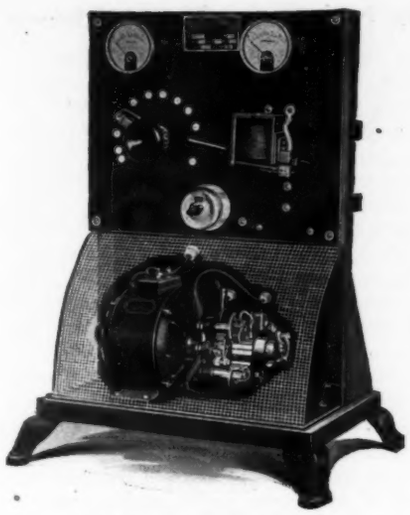
Klein Cable-Ring Crimper.

The design of tool shown has been found to be satisfactory for general all-around purposes. However, special designs suited for special types of cable rings can also be prepared by the makers of these tools, Mathias Klein & Sons, Chicago, Ill.

Commutator Rectifier for Battery Charging on a Commercial Basis.

The Stahl rectifier, which is shown in the accompanying illustrations, is designed for the charging of small storage batteries, such as automobile ignition, lighting and starting batteries. In garages where this work is ordinarily done for 50 cents a battery, with energy at usual rates, the garage owner generally undertakes this at a loss, or at best no profit, looking upon it as a matter of service to his patrons. With its excellent overall efficiency, which is claimed to be higher than that of any rectifier now on the market, its low first cost, practically foolproof construction and other features, the Stahl rectifier is said to make possible a profit to the garage owner on this class of business.

The single-circuit type is a self-contained charging

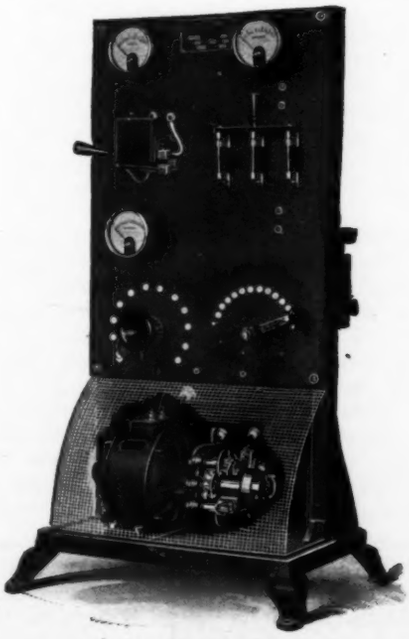


Single-Circuit Stahl Rectifier.

plant that will charge from one to five batteries (or up to a total of 15 cells) in the day time or at night. By keeping the rectifier running 24 hours a day and taking out each battery as soon as fully charged, on an average a total of 13 three-cell batteries can be given a full charge in 24 hours, allowing for the average amount of residual charge.

The single-circuit Stahl rectifier is supplied complete with switchboard, measuring instruments, control devices and everything to make it a thoroughly practical machine. The two-circuit machine has twice the capacity. Simplicity and high efficiency are the features which it is believed will recommend it most strongly.

Current from the alternatng-current supply is brought to two terminals at the back of the switchboard. From these terminals the current passes through the line switch to a special motor. On the extended shaft of this motor are two collector rings and beyond them a commutator. The synchronous motor is of such design that no further attention need be given in starting than to simply close the line switch, at which time the motor will start readily and fall into synchronism, remaining so even at a great reduction in voltage. The motor has no carbon brushes to keep in renewal. The only load on the motor is the friction of the brushes on the collector rings and the commutator.



Double-Circuit Stahl Rectifier.

The control of the direct current supplied by the set is such as to eliminate heating of the battery cells during charge, as well as many other battery troubles which are due to improper battery charging. The output is an interrupted direct current, and it is, therefore, claimed that it does no harm to charge batteries faster than the normal rate indicated on the battery. To charge a battery, all that is necessary is to insert the cable plug and then close a single switch.

Although the types here illustrated are of small capacity and low voltage to charge the class of batteries mentioned, larger sizes of the machines are made by the Stahl Rctifier Company, 538 South Clark Street, Chicago, Ill. These operate on the same principle and are made in any capacities desired. In these larger sizes, which are for vehicle and general storage-battery charging, the same exceptionally high efficiency is obtained.

National Calling System for Instantly Locating Executives in Large Plants.

With the growth of our industrial plants, in which efficiency is always the watchword, it is becoming increasingly difficult to locate an executive officer quickly in order that he may be communicated either directly from or through the main office. For this purpose, various methods of signaling to the different departments have been developed, of which the National Calling System illustrated herewith

Fig. 1.—Selecting and Calling Station.

possesses some unique features. It can be installed not only in large industrial plants, but equally well in large schools, hospitals or similar institutions, the offices of large corporations, department stores, etc.

The equipment is quite simple, consisting of only three elements as a rule. The first of these is the calling station, which is shown in Fig. 1. This usually is placed adjacent to the private-branch exchange telephone switchboard in the main office of the company or institution. Thus it is convenient to the chief operator, who can instantly transmit a call for an executive officer, whether he be called from some other office or department within the plant, or from some outside telephone. The principle is extremely simple. In the upper portion of the calling outfit is a set of eight levers, the position of which determines a definite

code signal. The sending of this signal is started by means of an operating key, shown in the lower right portion of the instrument. To the left of this key is a small pilot light, which by means of its flashes indicates whether the code number is being properly sounded.

Each executive has a particular code signal. If a call comes for him, regardless of its origin, the operator arranges the levers for his particular signal. In the illustration the signal is arranged for sounding the number 32, by means of three rings separated by a pause from two succeeding rings. It is said that the proper grouping of

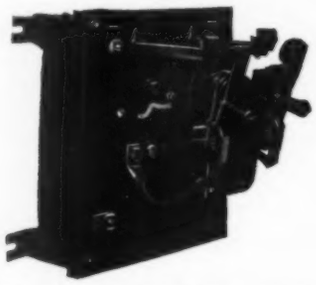


Fig. 2.—Relay for Calling System.

these eight levers can make as many as 45 different code combinations. The operating key will cause the signal to be repeated as many as seven times, if desired, the angle through which the key is turned determining the number of "repeats." The calling instrument or station is quite compact, measuring 14 by 10 by 3.5 inches. It is operated from any standard 110 or 220-volt lighting circuit.

The calling instrument governs the bells or other signals in the various departments through a relay. This, as shown in Fig. 2, is also quite compact and makes it possible to use relatively small currents in the calling instrument, whereas the signal bells necessarily will require a fairly heavy current if many of them are to be operated. This relay takes care of this heavier current. It can be located at any convenient point between calling or selecting instrument and the first signal on the line. These relays are made in various capacities ranging from 12 to 100 amperes, so as to be capable of operating anywhere from 24 to 200 bells.

The individual signals installed in the different departments or offices can be of various types, depending upon

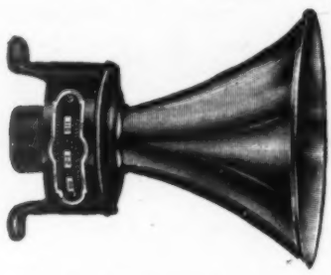


Fig. 3.—Signaling Horn.

particular conditions, such as the amount of noise prevailing. Single-stroke or double-gong bells can be provided as well as special vibrating horns or hummers. The outfit shown in Fig. 3 is a horn that can be installed either on the ceiling or side wall. This particular form is suitable for alternating current only and is specially desirable where there is much noise in the department where it is to be installed and consequently where a very intense and unusual note is necessary in the signaling instrument.

The National Calling System has been developed and is manufactured by the Electrical Division of the National Scale Company, Chicopee Falls, Mass.

The New Dodge Design Rheostat.

A unique improvement in rheostats, devised by Prof. H. L. Dodge, of the State University of Iowa, and known as the Dodge Design rheostat, has recently been placed upon the market. The new rheostat owes its peculiar advantages to the arrangement of the connections which is adaptable to any standard form of variable resistance element, although it is at present being applied only to the tubular type. Fig. 1 shows the instrument in the form in which it was developed, a Ruhstrat laboratory rheostat having been used for the variable resistance. As it is now being manufactured there is considerable variety in the appearance of the different makes and sizes, but the principle in every case is the same. Outwardly the new instrument is marked by completely differentiated line and load terminals, appropriately labeled, and a switch which throws the resistance element into either series or shunt relation with the load. The value of these features of the mounting is at once apparent, but they would mean little if they were not combined with a resistance element the winding of which followed certain principles which are an essential part of the Dodge design.

Among the advantages of the new type of rheostat may be mentioned the following. It is easy to connect and nearly foolproof. Both series and shunt or potentiometer relations are secured by the mere opening or closing of a switch. All values of current and voltage within the

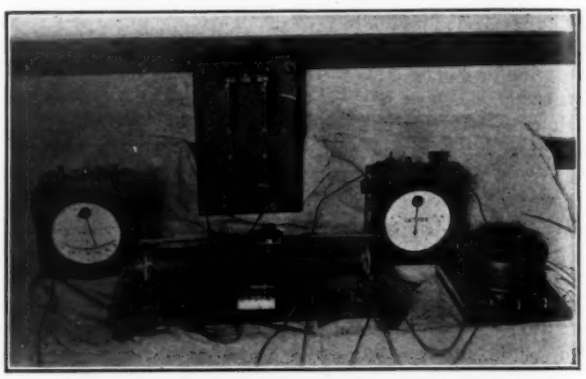


Fig. 1.—Typical Dodge Design Rheostat in Use.

limits of the source, the rheostat and the load are instantly available. The rheostats can be rated according to maximum voltage of source and current capacity. The combination of these features in a single instrument makes a rheostat which will be found most desirable wherever convenience and flexibility of current and voltage regulation is desired and it will be found indispensable for student use and extremely valuable in research and testing laboratories.

The convenience of the rheostat is due in part to the complete differentiation of the line and load terminals. The terminals being properly labeled, there can be no doubt as to the manner of connecting the instrument into the circuit. For this reason the instrument can be safely intrusted to inexperienced hands. Another foolproof feature is that the instrument, being designed for certain maximum voltages can be left on short-circuit indefinitely, provided, of course, that the slider is near the full resistance end. In order to indicate that this is the safest position for the slider, this end of the slider-bar is stamped with the word "safe."

The accompanying wiring diagram, Fig. 2, shows the ease with which the change from either series or shunt relation to the other is made. If one traces the circuits, he will find that when the switch is open the load is in series with that portion of the resistance to the left of the

slider. When the switch is closed the load is shunted across that part of the resistance to the right of the slider and at the same time the whole rheostat is connected across the line. With the switch open, values of current up to the full capacity of the rheostat may be secured. With it closed small values of current and voltage, down to zero, are possible. Thus all values of current and voltage from zero to the maximum can be obtained. The way in which overlapping of the two ranges is provided for, no matter what may be the load, is one of the outstanding features of the Dodge design.

To make this point clear let us consider a few practical

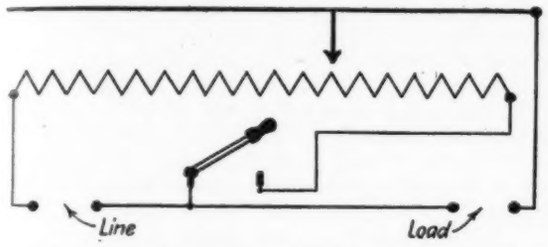


Fig. 2.—Circuit Diagram of Dodge Design Rheostat.

situations, such as occur every day in any laboratory. Let us assume that we have a 110-volt source and wish to pass a current of 2.5 amperes through a load of 15 ohms resistance. A 12-ampere, 5.2-ohm rheostat of the ordinary type certainly has sufficient current capacity.* But if it is connected in series, the smallest current that can be secured is five amperes. As it is impossible to shunt the rheostat across 110 volts without extreme overload the desired current cannot be secured.

Let us then take a rheostat which can be so shunted, one rated at 6.5 amperes, 18 ohms, for example. The lowest current which can be secured with this in series is 3.3 amperes, which is not low enough, and the highest current which can be secured with the shunt or potentiometer connection is 1.5 amperes,† which is far too small. Although this particular rheostat is able to furnish both large currents and small currents the current ranges do not come anywhere near overlapping and there is a large range of current which it cannot supply.

Using one of still smaller capacity, let us say a three-ampere, 83-ohm rheostat, we find that it can give a current on series connection as low as 1.1 ampere. With shunt connection currents from 0 to 2.3 amperes can be obtained without overloading the rheostat. With this rheostat the desired current can be obtained, but it will be noticed that the two ranges now overlap by a considerable amount and the very pertinent question arises as to whether it would not be possible to have a winding considerably larger than that of the three-ampere rheostat and still have overlapping.

If we try one rated at five amperes, 30 ohms, and make the appropriate computations, it is found that when the rheostat is in series with the load, currents from five amperes down to 2.5 amperes can be obtained and when it is in shunt relation, currents from 0 up to 2.5 amperes can be secured. Thus, for every load, there is a certain rheostat which will give overlapping and at the same time possess the highest possible current capacity.

As has been demonstrated, the ordinary type of rheostat, rated by current capacity and resistance nearly always fails in one of three ways. Either it cannot be used at all in shunt relation, or if it can it will not give overlapping of ranges, or else it will give more than enough overlapping, which means loss of current capacity. The difficulty of obtaining the desired currents together with the inconvenience and loss of time in changing connections is familiar to anyone who has used such rheostats.

With the Dodge design rheostat this is all avoided. The winding of each size is carefully arranged so that for any load, i. e., the worst possible load, there will be complete overlapping of current and voltage ranges and at the same time the maximum possible current capacity. If the rheostat has the proper voltage and current capacity, any desired value of current or voltage can be secured in an instant.

For every voltage and size of tube (radiating surface) and temperature rise, there is one winding and only one which will give overlapping for each and every load and also yield the maximum current. The formulas for determining this winding have been carefully worked out and are followed by the manufacturers who have secured the right of manufacturing under Prof. Dodge's patent. These are the Central Scientific Company, Chicago; James G. Biddle, Philadelphia, and the Leeds & Northrup Company, Philadelphia.

*The rheostats which are compared are all practical examples. They have the same physical dimensions and can dissipate the same amount of energy.

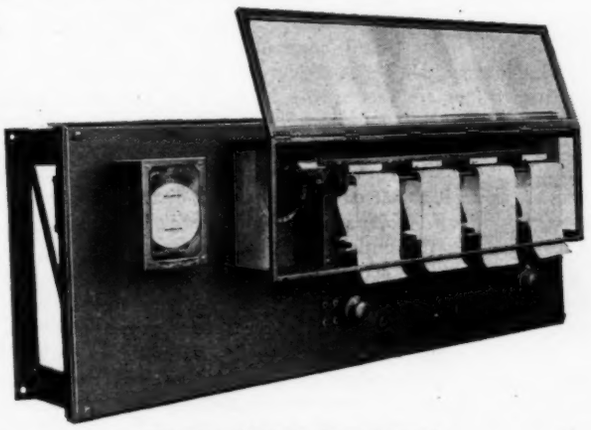
†When the slider is 4.5 ohms from the full-resistance end the remaining 13.5 ohms of the rheostat winding is carrying its full capacity of 6.5 amperes. The 3.5 ohms which is shunted with the load carries 5 amperes, while the load receives but 1.5 amperes.

Special Testing Outfit for Testing an Electric Shovel.

The Esterline Company, Indianapolis, Ind., recently built and shipped to Chile, South America, a complete testing unit for investigating the operation of an electric shovel at the copper mines of the Chile Exploration Company.

The apparatus consists of four graphic recording meters and an integrating wattmeter, all connected on a slate panel, which is also equipped with necessary transformers, wiring and jacks to enable any test to be made very rapidly without changing connections.

The graphic meter equipment consists of a polyphase wattmeter, single-phase ammeter, voltmeter and a speed recorder. The arrangement of jacks seen under the meters enables the operator to connect any one of the graphic meters with either the hoisting, thrust or turning motor or, if



Esterline Special Testing Outfit.

it is desired, the wattmeter and the ammeter can be connected to record the total load being taken by the shovel. The speed recorder is arranged for connection to either of the three motors.

The charts of the graphic meters are all coupled to run together at any speed from three to nine inches per minute, the speed of the chart being varied according to conditions under test. The chart is driven by a small motor, which can be seen at one end of the drive roll. The watt-hour meter is connected permanently to measure the total load taken by the shovel.

ACTIVITIES IN THE TRADE

The Chicago Mica Company, Valparaiso, Ind., has appointed W. B. Cosgrave, 50 Church Street, New York City, its special representative covering this territory.

Electric Service Supplies Company, Philadelphia, Pa., has awarded a contract for the erection of a new three-story and basement plant at Cambria and Seventeenth Streets.

Standard Underground Cable Company, Perth Amboy, N. J., manufacturer of insulated wires and cables, has filed plans for the erection of a four-story addition to its plant on High Street.

The Wheeling Tile Company, Wheeling, West Va., manufacturer of electrical porcelain specialties, has increased its capital from $150,000 to $300,000, to acquire the plant of the La Belle Pottery. The plant will be remodeled and extensive improvements made for manufacturing.

Benjamin Electric Manufacturing Company, Chicago, Ill., has issued a condensed catalog on Benjamin automobile accessories. Various types of auto horns of the company's manufacture are described, both of the vibrator and motor-driven types. Regulators, auxiliary lamps for instruments, rechargers for Ford magnetos, etc., are listed as well as garage lighting specialties and automobile tools.

The New Jersey Electrical & Auto Supply Company, 27 Halsey Avenue, Newark, N. J., has been incorporated with a capital stock of $25,000. J. J. Rafferty, for the past 10 years engaged in the electrical supply business and former general manager of the Caledonian Electric Company, Inc., of New York, is president and general manager of the new company. H. L. Doolittle, previously engaged in the packing-box business, is secretary and treasurer. The company will occupy an entire building at the above address.

Crocker-Wheeler Sales Convention.—On February 8, 9 and 10 the Crocker-Wheeler Company, Ampere, N. J., held a sales department convention at the Robert Treat Hotel, Newark, N. J. A discussion of present and future conditions formed one of the features of this convention. On the evening of February 9 a banquet was held. Dr. S. S. Wheeler, president; E. Lang, sales manager, and all the officers and department heads of the company were present, as well as all of the numerous district and branch managers of the company having charge of sales territories covering the entire country.

Sangamo Electric Company, Springfield, Ill., has issued Bulletin No. 45 which describes ampere-hour meters, known as type D-5. There is a rather comprehensive description of ampere-hour meters in the bulletin with detailed data regarding their construction and operation and numerous performance curves. Among the more prominent uses for which this type of meter is adapted are car-lighting service, central-station battery service, isolated plants, electric-vehicle service, wireless telephone exchanges, submarine boats, electric-railway cars, etc. Mention is made of each of these applications in the bulletin.

The Western Electric Company, New York, N. Y., is distributing a broadside on its 1917 fan campaign. The circular calls attention to the various helps which the company is prepared to furnish its agents, these including electrotypes of the various types of fans, a booklet printed in colors and imprinted with the dealer's name, to be sent to a selected list of prospects, display cards for use in show windows, street cars and on counters, lantern slides for use in local motion-picture theaters, and electrotypes of suitable newspaper advertisements. To encourage progressive fan merchandising, the company offers a cash prize of $100, a second prize of $50 and five additional prizes of $10 each to the dealers that submit what is considered to be the best all-around fan-sales campaign. The factors on which awards will be made are: (1) window displays, (2) methods used in house-to-house canvassing, (3) personal sales arguments used, (4) the use of printed advertising matter, (5) local newspaper advertising, (6) lantern slides in local motion-picture theaters, (7) increase in 1917 fan business over 1916, and (8) the general campaign as a whole. A board of judges, comprising representatives of the various electrical journals and a member of the staff of the Society for Electrical Development will decide the contest.

New Westinghouse Plant.—Announcement has just been made by the Westinghouse Electric & Manufacturing Company that the plot of ground recently purchased at Essington, near Philadelphia, Pa., will form a new industrial center for the Westinghouse Electric interests. The site, as mentioned in a previous issue, embraces about 500 acres, with a frontage of approximately one mile on the Delaware River. Additional transportation facilities will be afforded by tracks from the Pennsylvania and Philadelphia and Reading Railroads. This new center will be devoted to the production of large apparatus, the first group of buildings being for power machinery, principally steam turbines, condensers, and reduction gears. The initial development will cost in the neighborhood of $5,000,000 or $6,000,000 occupying about one-fifth of the area of the entire plot. The group will consist of the following buildings; two large machine shops, an erecting shop for heavy machinery, forge shop, pattern and pattern-storage shop, and power house. Work will begin on these as soon as satisfactory building contracts can be let. The number of employees to be engaged at the new plant has not as yet been definitely determined but will number several thousand people, and undoubtedly will in the future equal the number employed at East Pittsburgh, representing over 20,000 people. Westinghouse, Church Kerr & Company, New York, N. Y., are the engineers for the company.

Harrison Safety Boiler Works, Philadelphia, Pa., has issued a 100-page booklet in which the uses of open heaters in connection with the heating, metering and softening of water for boiler and other purposes are exhaustively treated. The amount of fuel that can be saved by the use of exhaust steam to heat feed water is first explained, and a convenient diagram is given by which the percentage of fuel saving in any given case can be easily be ascertained. The essential parts of an open feed-water heater are then considered, after which there are chapters on heating boiler feed in condensing steam power plants, including various arrangements to be used where the supply of exhaust steam is excessive or deficient, the effects of open heaters in connection with exhaust steam-heating and drying systems, exhaust-steam heating in connection with condensing steam power plants, etc. Finally, there is a point by point comparison of the open heater, as represented by the Cochrane feed-water heater, with the closed or pressure type of heater, ending finally with suggestions for the specification of an open feed-water heater. This book covers in a very complete manner the important matters of handling feed water and exhaust steam and should be of value to those who design, manage or operate steam power plants.

PERSONAL AND BIOGRAPHICAL

MR. ELMER DENLINGER, Intercourse, Pa., has been re-elected president of the Intercourse Electric Light, Heat & Power Company.

MR. J. G. LAURY, Philadelphia, auditor of the Lansford Gas Company, Lansford, Pa., has been appointed manager of the company.

Mr. DOUGLAS I. McKAY has been elected a vice-president of J. G. White & Company, Inc., of New York. Mr. McKay has been acting in the capacity of assistant to the president for the past two years and previous to that was police commissioner of New York City.

MR. WILBUR A. GIFFEN, for the past six years office manager for the Rockford (Ill.) Electric Company, and an employee of that company for the past eight years, has been appointed commercial manager, succeeding Mr. A. C. Martin.

MR. J. HENRY RUSSELL has been elected president of the Cambridge Electric Light Company, succeeding the late Josiah Quincy Bennett. MR. GUSTAVUS GOEPPER has been chosen vice-president, succeeding Mr. Russell, and MR. JOHN H. CORCORAN has been made a member of the executive committee.

MR. A. W. HARTIGAN of the New York sales department of the Western Electric Company has been appointed sales manager of the Electrical Alloy Company with headquartrs at 41 Union Square, New York City. Mr. Hartigan has been with the Western Electric Company for several years handling the sales of larger electrical appliances, such as washing machines, vacuum cleaners, dish washers, etc., in the New York territory.

MR. A. C. MARTIN connected with the Rockford (Ill.) Electric Company, since 1910 has been appointed manager of the Steubenville & East Liverpool Railway & Light Company, Steubenville, O. Mr. Martin is a graduate of the United States Naval Academy and was previously connected with the Westinghouse Machine Company. He later became chief engineer of the Sheffield (Texas) Electric Company, and in 1910 accepted a position in the commercial department of the Rockford Electric Company. He was appointed commercial manager for the company in 1912 and has held that position until his appointment as manager at Steubenville.

MR. E. B. MERRIAM, for several years assistant engineer of the switchboard department of the General Electric Company has resigned his position to assume much more important duties. He now heads the Industrial Service Department recently organized to supervise education, employment and provision of opportunities for advancement of employees at the Schenectady plant of the company. Mr. Merriam brings to his new position a broad and sympathetic understanding of the requirements of the situation. He has been connected with the General Electric Company for 16 years, starting as a student in the testing department and later doing service in commercial, manufacturing and engineering development and research work. Mr. Merriam is well known among electrical men as a prominent member of the American Institute of Electrical Engineers and particularly for his work in connection with high-voltage automatic, circuit-interrupting apparatus, and has contributed a number of technical papers on protective apparatus. He was chairman of the Schenectady section of the American Institute in 1913.

MR. J. C. KIRKPATRICK, who was elected president of the Northern White Cedar Association at its annual convention in Minneapolis last week, is known throughout the cedar pole industry as the father of the business. The cedar business was originally launched by the Pittsburgh & Lake Superior Iron Company, who owned large tracts of timber lands, as well as mining lands in the Upper Peninsular of Michigan. In 1906 it was deemed advisable to separate these two ventures and at that time the National Pole Company was organized with Mr. Kirkpatrick as president and general manager which position he has held continuously ever since. Mr. Kirkpatrick is also president of the Pittsburgh & Lake Superior Iron Company and has been in the employ of this company continuously since 1876. He is also president of the American Cross Arm Company, of Chicago, and has numerous other interests throughout the country. Mr. Kirkpatrick has worked untiringly in the interests of the cedar-pole industry and it is largely because of his constructive work that

Mr. J. C. Kirkpatrick.

the various interests involved have worked so harmoniously during recent years. He has seen the business grow from a very small venture to what is now a very extensive industry and one of the important branches of the electrical business. His election as president of the Northern White Cedar Association is a well deserved honor and one that causes a great deal of pleasure for all cedar-pole men.

OBITUARY.

MR. LYMAN E. COOLEY, engineer and one of the most noted authorities on the waterways of this country, died at his home, Evanston, Ill., on February 3, after an illness of but a few days. Mr. Cooley was born in Canandaigua, N. Y., in 1850. He was graduated from the civil engineering course of Rensselaer Polytechnic Institute, Troy, N. Y., in 1874, and after some technical teaching and editing experience began his long career as a consulting civil and hydraulic engineer on almost every waterway improvement of note that has been carried on in this country during the last 40 years. Among his best known works was the drainage canal of the Sanitary District of Chicago, of which he was chief engineer and later consulting engineer for a great many years. Mr. Cooley was president of the Western Society of Engineers in 1890-1891.

MR. GEORGE HENRY HILL, assistant engineer of the railway and traction department of the General Electric Company died, after a short illness, from pneumonia at his home in Schenectady, N. Y., on the night of January 31. Early in his career he invented and patented the electric system for operating bulkhead doors on ships, which many years ago was standardized by the Navy Department of United States and is now used on commercial and naval vessels in many parts of the world. Later he assisted in the development of the multiple-unit system of train control and in connection with this work produced the multiple-unit automatic system practically as it exists today. During the past few years Mr. Hill has devoted considerable time to the electrification of steam railroads and has been an ardent supporter of high-voltage direct current for interurban railways and for steam trunk line electrifications. More recently he has been engaged in exhaustive studies of the interference of transmission and railway feeder lines with telephone and telegraph circuits. Mr. Hill was born at Williamsport, Pa., on December 11th, 1872, where he attended the local preparatory schools and Dickinson Seminary. After completing his preparatory work, he entered Johns Hopkins University at Baltimore, graduating from the Electrical Engineering Course in 1895. Immediately upon graduation he became associated with Frank J. Sprague who was at that time engaged in the development of electrically-operated elevators and multiple-unit control for railway service. He soon became chief of construction of the Elevator Department with his office in New York City. When the Sprague Electric Company gave up its elevator business in 1900 he became chief engineer for the Company at Bloomfield, N. J. and was directly responsible with Mr. Sprague for the development of multiple-unit control for railway trains. In 1902 the Sprague patents and interests were taken over by the General Electric Company and Mr. Hill came to Schenectady to follow the further development of electric train control.

CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

CHELSEA, MASS.—Mayor Edward E. Willard has plans underway for a municipal lighting and heating plant.

QUINCY, MASS.—The Electric Light Company has submitted a new contract for lighting the city. The company has reduced its price per lamp and has agreed to furnish a more powerful light than that of the incandescents with which the streets are now equipped.

MIDDLETOWN, CONN.—The Franklin Electric Company, employing 300 hands, has plans for additions that will provide space for much additional equipment and for doubling the present force of employees.

AKRON, N. Y.—The plans of the village of Akron for a municipal electric light and distribution plant have been approved by the Public Service Commission, Second District.. At a special election the village voted $19,000 of bonds to carry it out. The current for the plant will be purchased from the Genessee Light & Power Company.

BUFFALO, N. Y.—The Buffalo General Electric Company is asking bids for the erection of a new unit to its power plant on the Niagara River.

HIGHLAND FALLS, N. Y.—Electric current has recently been brought into this city by the Orange and Rockland Electrical Company of Monroe, N. Y.

LONG ISLAND CITY, N. Y.—Commissioner Kracke of the Department of Plants and Structures is planning changes in the lighting system. Among places which will receive much attention is the Queensboro Bridge Plaza.

NEW YORK, N. Y.—A movement to make the blocks between Forty-second and Forty-sixth Streets in Sixth Avenue brighter at night has been launched by some of the business concerns in that district. Jack Dunston is chairman of the committee.

ROCHESTER, N. Y.—Applications have been filed by the Rochester Railway & Light Company for permission to erect three buildings below the lower falls, opposite Ravine Avenue, in connection with the power tunnel project now under way. All buildings will be of reinforced concrete. They will cost, approximately, $140,000. Work on the excavation and foundations has been started. One of the buildings will be an operating room for dams, with dimensions of 25 by 40 by 15 feet. It will cost $15,000. The largest of the three will be a power station 75 by 90 by 104 feet and will cost $100,000. An intake and rack house, at the end of the tunnel, will be 36 by 100 by 29. It will cost $25,000.

SYRACUSE, N. Y.—Lilly Post No. 66, G. A. R., approved the plan for illuminating the Soldiers and Sailors Monument in Clinton Square at night. Captain James A. Allis is commander of the post.

UNADILLA, N. Y.—Many extensions and new connections for the lines of the Standard Light, Heat & Power Company, in Delaware and Otsego Counties, have been approved by the Public Service Commission at Albany. It is authorized to extend its lines from its present plant in the village of Sidney through the town of Sidney, except to East Sidney and Sidney Center, where the Delaware and Otsego Light & Power Company is established. Other franchises approved are for the town of Butternuts and the village of Gilbertsville, Otsego County.

BAYONNE, N. J.—Property owners on Broadway, from Tenth to Eighteenth Street, have presented a petition to the City Commission for the installation of a street-lighting system, to connect with the system on upper Broadway.

NEWARK, N. J.—The Robinson-Roders Company, manufacturer of feather goods, is building an auxiliary electric power station at its plant on New Jersey Railroad Avenue to cost about $25,000, for factory operation.

NEWARK, N. J.—The Common Council is planning for the installation of an electric power plant at the new East Side Public Bath.

PERTH AMBOY, N. J.—The Public Service Electric Company will install an underground system in Buckingham Avenue, Broad and Front Streets, to extend its power lines to the plant of the Roessler & Hasslacher Chemical Company.

COLUMBIA, PA.—The West End Rolling Mill is arranging for the installation of new motor equipment for electric operation of the plant. Edward T. Edwards is the proprietor.

HAMBURG, PA.—The Hamburg Gas & Electric Company has entered into agreement with the Metropolitan Electric Company for power service from its Reading plant. The company will shut down its local plant in February, to be held available for emergency service when necessary.

HARRISBURG, PA.—On recommendation of Chairman T. T. McEntee, of a special street light committee, council authorized the installation of ten 2,000-candlepower arc lights in the business section of Front Street.

MAHANOY CITY, PA.—The Reading Coal & Iron Company will install an electric plant at its Knickerbocker colliery, to furnish light and power for operation.

MILLERSBURG, PA.—Progress is being made on the building of the new electric light plant east of town. The main building has been under roof for several weeks and workmen are constructing the concrete foundations for the engines and generators.

NORRISTOWN, PA.—The Counties Gas & Electric Company has entered into agreement with the supervisors of West Norristown Township for the installation and operation of a street-lighting system, consisting of incandescent lamps, for a period of five years.

PHILADELPHIA, PA.—The contracts of the city of Philadelphia and the Philadelphia Electric Company have been listed for submission to the commission for approval for 1917. The contracts will include street lighting and Fairmount Park lighting.

OCEAN CITY, MD.—The Ocean City and Fenwick Island Railway Company has been organized to build an electric railway eight miles up the beach to Fenwick Island. The construction contract has been let to Thos. E. O'Connell of Phoenixville, Pa., who is also chief engineer. Address W. B. S. Powell, president of the company, of Ocean City.

MOUNDSVILLE, WEST VA.—On January 26, fire at the plant of the Mineral State Coal Company, Parr's Run, destroyed the generator plant and fan house.

CHARLOTTE, N. C.—The Neverdarn Hosiery Mills has had plans prepared for a new plant to cost about $50,000. Equipment will be installed for electric operation. Clarence O. Kuester is proprietor.

LA GRANGE, N. C.—The city will soon construct a lighting system, including about 12 miles of power transmission line, substation, arc lights and distribution. J. W. P. Smithwick is mayor of the city.

THOMASVILLE, N. C.—Thomasville Hosiery Mills, recently organized, will install equipment for electric operation of its plant. G. Arthur Evans is president of the company.

CHIPLEY, GA.—Plans are being considered for the establishment of a municipal electric lighting system. Address the mayor.

SAVANNAH, GA.—The agreement between the city and the Savannah Electric Company has been somewhat altered. The change which went into effect February 1, 1917, calls for considerable changing of the old lighting system.

NORTH CENTRAL STATES.

ALLIANCE, O.—Proposed improvements in the plant and transmission lines of the Alliance Gas & Power Company will be taken care of with the proceeds of additional stock. The company's capitalization is to be increased from $550,000 to $1,550,000.

CINCINNATI, O.—Many dynamos and other electrical apparatus at the plant of the Cincinnati Car Company have been destroyed by fire. The loss is estimated at $75,000.

LEIPSIC, O.—Several breakdowns have occurred recently in the city power plant. Extensive repairs or replacements are said to be necessary.

LORAIN, O.—The erection and installation of a complete new electrical distributing system for Lorain is to be begun early in the coming spring by the Lorain County Electric Company, to whom a 25-year franchise of the Citizens Gas & Electric Company was recently assigned. In addition to the establishment of office quarters and the erection of a new distributing system the electric company plans extensive improvements, including additions to the central power station on the lake front at First Street. Address J. B. Johnson, general manager.

MADISONVILLE, O.—Mayor Puchta will call a conference of the Board of Control and the city solicitor to discuss the advisability of selling the municipally owned Madisonville electric light plant to the highest bidder.

PIQUA, O.—New fire-alarm and police-patrol systems are contemplated by the city. Specifications are being prepared by the chief of the fire department and as funds are available, the city may decide to install both systems at the same time.

PIQUA, O.—The boulevard lighting system for the downtown streets is to be installed soon by the Dayton Power & Light Company at an estimated cost of $25,000.

TOLEDO, O.—M. R. Bump, chief engineer of the Doherty Company, is in Toledo giving special attention to the arrangements for a new high-tension electrical circuit to be built around the city. The Toledo Railways & Light Company reports many inquiries are being received in regard to the line from out of town power users.

TROY, O.—A new plant to take care of the power requirements of the city's water and light systems may be constructed, or the plant at the waterworks may be enlarged to provide for the electric business. The authorities are consulting with the Richards Engineering Company, Columbus, O.

YOUNGSTOWN, O.—A franchise has been granted to the Youngstown & Sharon Street Railway Company to construct and operate an electric plant to furnish electricity.

SALEM, IND.—The local power plant of the Interstate Public Service Company was put out of commission some weeks ago by fire and has been repaired temporarily, until permanent replacements can be made.

GALVA, ILL.—The control of the Galva Electric Lighting Company has been purchased by the Galesburg Railway, Lighting & Power Company, Galesburg, Ill. One of the most important changes contemplated by the new company, is the installation of a direct transmission line from Galesburg to this city. The service will then be sent out from here to the cities which are now being served, namely: Cambridge, Ulah, Bishop Hill, LaFayette, Victoria, Altona, Oneida and Wataga. This will mean that the generating plant in Galva may be shut down except during the winter months, or for an emergency.

MONROE, MICH.—Proposals for taking over the municipal lighting plant here will be submitted to the city commission by the Toledo (O.) Railways & Light Com-

pany and the Detroit Edison Company of Detroit, Mich. The city recently purchased the plant from private interests but has experienced a great deal of trouble in its management since.

AMERY, WIS.—E. J. Schneider, owner of the local hydroelectric plant, has let the contract for the construction of a dam and the development of another similar plant, also on Apple River. The new power which is to be used in operation by August 1 will supply electric current for Turtle Lake, Almena, Comstock and Clayton.

CAMBRIA, WIS.—The Wisconsin Light, Power & Heat Company is now putting up poles here on which to string wires for the town's electric lighting system.

MILWAUKEE, WIS.—Public Works Commissioner Simmons has been directed to make an investigation on the feasibility of building a power plant to furnish light, heat and power for the city hall. It would cost about $40,000 according to estimates.

BADGER, MINN.—Plans are being considered for the installation of an electric light plant. Address H. V. Larson, city clerk.

ST. PAUL, MINN.—The St. Paul Gas Light Company has under consideration the erection of a $1,000,000 electric power plant on the upper levee. The company has nearly completed a large meter house on its upper levee property and will erect a new gas purifier building in the spring. The new electric power plant will be for the generation of electricity by steam. It will be of steel and concrete construction and will cover almost all of the remaining property originally purchased for the erection of a coal-gas plant.

VIRGINIA, MINN.—According to Superintendent H. J. Underhill, the Great Northern Power Company intends to do much construction this spring. A second line is to be put in from Fond du Lac to Hibbing.

FARMINGTON, IOWA.—The council will place before the people the proposition to issue municipal light bonds. Address the village clerk.

ST. LOUIS, MO.—The Union Electric Light & Power Company, subsidiary of North American Company, has applied to Missouri Public Utility Commission for authority to issue $3,000,000 additional capital stock. The commission has already approved an additional bond issue of $1,600,000.

BUNKER HILL, KANS.—An investigation by the city council is under way regarding the building of a double-unit, alternating-current plant. It is expected that such a plant will cost $12,000.

CALDWELL, KANS.—The city has voted $80,000 in bonds. The proceeds will be used for extending the water and electric lighting systems.

OAKLAND, KANS.—The Topeka Railway Company will soon have the electric lighting system in this city completed.

FULLERTON, NEBR.—The Fullerton Electric & Power Company intends to build a dam across Cedar River. It will be of steel and concrete construction.

OMAHA, NEBR.—Architect George B. Prinz has completed plans for the plant for the Nebraska Telephone Building, at Nineteenth and Douglass Streets. Work will begin early in spring.

OMAHA, NEBR.—The Union Pacific Railroad Company contemplates the installation of a power house. Address R. L. Huntley, chief engineer, Omaha.

ALEXANDRIA, S. D.—The municipal lighting plant here is worked beyond capacity and it is proposed to issue bonds to the extent of $18,000 or $20,000 to provide for the purchase of a new engine and other equipment.

ASHLEY, N. D.—The board of trustees has granted permission to S. P. Waage, Minneapolis, for the operation and the erection of an electric light plant.

PRINSMADE, N. D.—Ways and means are under consideration to establish a municipal light plant.

SOUTH CENTRAL STATES.

BOONSVILLE, KY.—The city voted $10,000 bonds to install electric light plant. Address the mayor.

GEORGETOWN, KY.—An ordinance providing for a vote on a $100,000 water and light bond issue has passed its first reading in the city council. Councilman R. W. Porter is author of the ordinance.

GUTHRIE, KY.—The South Kentucky Power Company has purchased the Elkton, Ky., electric lighting property, on which it has had an option, taking possession on February 1. A. F. Trimble, Guthrie, Ky., is vice-president and general manager of the company which has power plants at Hopkinsville, Ky., and Watertown, Tenn., supplying six Kentucky towns and two Tennessee towns.

HAZARD, KY.—The Kentucky River Power Company, which is now supplying 16 mines with electric power, has decided to add another 2,000-horsepower turbogenerator to its power plant.

LA CENTER, KY.—High cost of coal is assigned by H. H. Evans as the cause for the suspension of electric light and power service by his property, which has been supplying the city. Candles and kerosene lamps are in use.

LA CENTER, KY.—The LaCenter Light & Power Company has been organized. S. T. Payne is president and the company will enlarge the plant.

MANCHESTER, KY.—The city is considering the installation of electric light plant and $25,000 has been subscribed and small bond issue will be voted. Address the mayor.

McKEE, KY.—The city will vote in April on a $60,000 bond issue to construct an electric light plant and water works.

MURRAY, KY.—W. E. King, Covington, Tenn., has been let the contract for installing the municipal light plant. He will come to this city early in February. It is not known when work will begin as all bids for bonds were rejected by the council at the same meeting at which King was awarded the contract.

PADUCAH, KY.—Merchants along two blocks on Second Street are organizing to erect a white-way system.

ALAMO, TENN.—Marion Darden, formerly of Brownsville, Tenn., has the franchise for electric lighting service to the city and will establish a plant here.

ELIZABETHTON, TENN.—It is said that J. H. Grayson intends to put a dam in the Watauga River near here. A hydroelectric plant will be installed later, which will supply electricity for this city.

KINGSPORT, TENN.—At a cost of $350,000 the Clinchfield Portland Cement Company is completing a power house here which will supply the company's plant, the city of Kingsport and other industries.

ANDALUSIA, ALA.—The Andalusia Light & Power Company will improve the electric light plant.

NEWPORT, ARK.—The Newport Water, Light & Power Company has sold its plant to the Arkansas Light & Power Company. The consideration was $150,000, which represents the purchase price of all the company's interests in Newport, with the exception of its store property.

SHREVEPORT, LA.—The Southwestern Gas & Electric Company contemplates enlarging the power house to cost $100,000.

ADA, OKLA.—Parties have been looking over the site of the Oklahoma Light & Power Company and it is expected that work will start soon. The company proposes to build a $3,000,000 plant.

ALVA, OKLA.—The Albert Emanual Company of Dayton, O., has purchased the Alva Light & Power Company for $100,000.

SAPULPA, OKLA.—The Pioneer Telephone & Telegraph Company, of this city, procured a building permit for the erection of a modern three-story building to cost $38,000. Equipment, including a large new switchboard to cost $70,000, is to be installed in the new home. Address general manager.

TULSA, OKLA.—The council is planning to install a white way. H. Simmons is mayor.

GATESVILLE, TEX.—The city's light and power plant here was recently destroyed by fire. The loss was about $15,000.

PAN HANDLE, TEX.—The question of issuing municipal light bonds will be submitted to a vote. Address the mayor.

PORT ARTHUR, TEX.—Stone & Webster interests have announced the coming erection of a $300,000 power plant here, trebling the present power facilities. Work will begin as soon as the surveyors line out the grounds. Material is being assembled. The American Construction Company of Houston has started placing cement for 792 pilings.

SAN ANTONIO, TEX.—The Southern Telephone Company is planning to erect a new exchange. The building will be three stories high and will cost about $35,000. Address local superintendent.

WICHITA FALLS, TEX.—The Wichita Falls Electric Company, a subsidiary of the Strickland interests, has announced that work will start shortly on a power line to Henrietta, 18 miles east of here, in Clay County.

WESTERN STATES.

DENVER, COLO.—Two electric lighting projects have recently been submitted to the city council here. The first was an ordinance for the installation of an ornamental system of lighting on Fourteenth Street from Colfax Avenue to the Platte River viaduct, to cost approximately $15,000, which property owners have agreed to pay. The cost of the standards is $150 each. The other project submitted came in the form of a petition from residents in the Park Hill district, where plans were prepared for the installation of a total of 274 new lamps.

CASA GRANDE, ARIZ.—Bids have been called for by the Common Council for the installation of municipal water, light and power plants. The bids are to cover both buildings and equipment.

WILLCOX, ARIZ.—The citizens of this place have voted to grant an electric light and power franchise to Neil McMillan.

YUMA, ARIZ.—According to an announcement made by the Yuma Light, Gas & Water Company establishments using electric motors must secure alternating-current motors to take place of the direct-current motors. The change must be made within 30 days. The new motors must be 222-volt three-phase and 60 cycles.

GRANGEVILLE, IDAHO.—The Grangeville Electric Light & Power Company, T. A. Bayless, superintendent, announces that a concrete dam to cost $40,000 to $60,000 and capable of producing 10,000 horsepower is to be constructed.

LEWISTON, IDAHO.—A committee of the Commercial Club has formed an organization with the object of promoting the erection of a hydroelectric plant.

CLE ELUM, WASH.—The town of South Cle Elum has petitioned the county commissioners for a franchise to construct, equip and maintain electric transmission lines, along certain highways in the vicinity, for lighting, heating and power purposes.

SEATTLE, WASH.—The Chicago, Milwaukee & St. Paul Railway Company will electrify its lines between Seattle and Othello, a distance of 210 miles, in the near future. The Montana and International Power companies from which the Milwaukee secures its power have sites in the Cascade mountains and along the St. Joe and in the vicinity of Spokane. The cost will approximate $8,000,000. The work is to be completed in 18 months and probably will conform to the electrified system east of here.

TACOMA, WASH.—More electric power will be needed soon in this city and the question of additional units is being investigated by Light and Water Commissioner Gronen.

DATES AHEAD.

New Mexico Electrical Association. Annual convention, Albuquerque, N. M., February 12-14. Secretary pro tem., E. A. Thiele, Roswell, N. M.

American Institute of Electrical Engineers. Mid-winter convention, New York City, February 14-16. Secretary F. L. Hutchinson, 33 West Thirty-ninth Street, New York City.

Wisconsin Electrical Association. Annual meeting, Hotel Pfister, Milwaukee, Wis., March 15-16. President, W. E. Haseltine, Ripon, Wis.

Tri-State Water and Light Association of the Carolinas and Georgia. Annual convention, Macon, Ga., April 17-19. Secretary, W. F. Steiglitz, Columbia, S. C.

Southwestern Electrical and Gas Association. Annual convention, Dallas, Tex., April 26-28. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

Arkansas Association of Public Utility Operators. Annual convention, Pine Bluff, May 16-18. Secretary-treasurer, R. B. Fowles, Pine Bluff Company, Pine Bluff, Ark.

Electrical Supply Jobbers' Association. Semi-annual meeting. Homestead Hotel, Hot Springs, Va., May 22-24. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

TACOMA, WASH.—Plans for the expenditure of more than $2,000,000 by the city for acquisition and development of an additional electric power plant or $300,000 for the building of a steam auxiliary plant have been made by the city council. This will meet the estimated future demand for light and power when the city is called upon to furnish energy for the army post and proposed shipbuilding concerns.

HILLSBORO, ORE.—A power plant is to be erected by the Carnation Food Product Company at a cost of $75,000. It will be built in this city soon.

PORTLAND, ORE.—The Northern Idaho & Montana Power Company, which recently passed into receivership is to be reorganized. The company took over the holdings of private corporations operating light, power and water plants in western Oregon ten years ago. Elmer Dover, Tacoma, president of the company, is receiver.

ALAMEDA, CAL.—The Board of Electricity of this city has called for bids for furnishing the department of electricity with a water-softener or purifier.

CHICO, CAL.—Nearly 70 per cent of the frontage necessary for the installation of an electrolier system by private contract has been signed by W. H. Gribble, of the Western Gas & Electric Appliances Company.

ESCONDIDO, CAL.—Between $15,000 and $20,000 will be expended on the plant of the Escondido Utilities Company by the San Diego Consolidated Gas & Electric Company, which recently took over the properties. About $5,000 will be spent in rebuilding the street-lighting system.

LIVERMORE, CAL.—The Board of Trustees has instructed the Pacific Gas & Electric Company to make several changes in the placing of lights on College Avenue.

LOS ANGELES, CAL.—With the object of taking over the special street-lighting lines of the Los Angeles Gas & Electric Company, the Board of Public Service Commissioners has asked the corporation to open negotiations. If no agreement can be reached the city will apply to the State Board of Railway Commissioners for condemnation of the lines.

LOS ANGELES, CAL.—March 8 is the date set for the election on the proposed power bond issue and the charter amendment to permit the city to buy the Southern California Edison and the Pacific Light & Power Companies' distributing systems

LOS ANGELES, CAL.—The Board of Supervisors has called for bids for improvement work in the Graham lighting district.

NEW CASTLE, CAL.—The Pacific Gas & Electric Company has been awarded the five-year contract for lighting New Castle. The system is to be rebuilt.

RIALTO, CAL.—The Rialto Light, Power & Water Company is making plans for extending its lighting system out Rialto Avenue.

RIVERSIDE, CAL.—The Board of Public Utilities has approved the petition of property owners for the extension of the lighting system from Magnolia Avenue to Monroe Street.

SAN BERNARDINO, CAL.—The Rialto Light, Power & Water Company will install electric lights on Rialto Avenue from Sycamore Avenue east to Eucalyptus Avenue.

SAN FRANCISCO, CAL.—The Pacific Gas & Electric Company has sold to the National City Company and Harris, Forbes & Company $3,060,000 general and refunding five-per-cent bonds. The proceeds will go to paying off underlying bonds and for improvements for the Oro Electric Corporation.

SAN FRANCISCO, CAL.—The Western Gas & Power Company has been incorporated here by S. Forney, B. Silverstein, E. J. Schultz, E. H. Hall and J. C. Wheeler, Jr. The capital stock is $1,000,000.

SANTA BARBARA, CAL.—The city hopes to have completed the State Street lighting system before the military encampment opens in June. Bids for the ornamental lights and metal standards to Sola Street and concrete standards from De la Guerra Avenue to the boulevard will be received.

SANTA ROSA, CAL.—The Pacific Gas & Electric, the Great Western Power and the Pacific Telegraph & Telephone companies have been called before the city council to show cause for not living up to an agreement to place wires on joint poles where possible. It is alleged there are about 1,500 unnecessary poles on the streets.

Proposals

ELECTRIC WIRING.—Sealed proposals will be received by the board of education of the city school district of Dayton, O., at the office of the clerk of said board, until 12 o'clock, noon, Tuesday, February 27, 1917, for all labor and material required by the plans and specifications for the electric wiring, electric light fixtures, etc.

SUBSTATION.—Sealed bids will be received by the South Park Commissioners, 57th Street and Cottage Grove Avenue, Chicago, February 21, for all labor, and material to construct, complete, an electrical substation at Marquette Road and Hamilton Avenue, including sewer and electrical conduit. Specifications and blank bidding forms are on file at the South Park Commissioners office. Address J. F. Neil, Secretary.

BRIDGE CRANES.—Sealed proposals will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until February 19 for furnishing and installing one 40-ton and four 10-ton bridge cranes at each of the navy yards, Norfolk, Va., Philadelphia, Pa., and Puget Sound, Wash. Plans and specifications may be obtained on application to the Bureau of Yards and Docks or to the commanders of the navy yards named.

TELEPHONE LINE.—Sealed proposals will be opened in the office of the Supervising Architect, Treasury Department, Washington, D. C., on March 2, for furnishing telephone connections between the United States Quarantine Station at Galveston, Tex., and the city of Galveston, in accordance with drawing and specification, copies of which may be had at the above office or at the office of the custodian, in the discretion of Acting Supervising Architect Jas. A. Wetmore.

NAVY ELECTRICAL SUPPLIES—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Washington, D. C., Schedule No. 677, 44,000 feet of steel conduit. Philadelphia, Pa., Schedule 687, 5 electric winches. Brooklyn, N. Y., Schedule 688, 10 motor-driven sewing machines. Charleston, S. C., Schedule 696, 2 contact makers, bells, etc.; 13 gong contact makers; 2 gong pulls; 2 electric heaters; 1 electric whistle outfit; 4 portable ventilating sets; 1 each, fire-room telegraph transmitter and indicator; 2 engine telegraph transmitters and indicator; 5 rudder-angle transmitters; 1 shaft-revolution transmitter. Bidders desiring to submit proposals should make application to the Bureau or nearest office.

LIGHTING SYSTEM.—Sealed bids will be received by the Commissioner of Gas and Electricity at his office, Room 614, City Hall, Chicago, on February 13, for furnishing labor and materials necessary for the construction of an electric lighting system to be installed during 1917 and 1918, consisting of approximately 25,000 100-candlepower type "C" Mazda residence units and 5,000 600-candlepower type C Mazda lamps, which will include the necessary substation, transmission and feeder-cable systems, conduit and manhole construction, armored-cable circuit construction, fiber-duct circuit construction and post setting. Proposals will also be received for furnishing and delivering the following approximate amounts of material for use during the year 1917: 1,875,000 feet No. 8, varnished-cambic, lead-covered 600-volt cable; 216,000 feet No. 8 varnished-cambic, lead-covered 5,000-volt cable, 1,875,000 feet No. 8 varnished-cambic, lead-covered steel-armored 600-volt cable; 1,325,000 feet fiber duct; 116,000 feet eight-conductor paper-insulated, lead-covered No. 8, 5,000-volt cable; 52,000 feet four-conductor, paper-insulated lead-covered No. 8 5,000-volt cable. Address William G. Keith, commissioner.

LIGHTING FIXTURES.—Sealed proposals will be opened in the office of the Supervising Architect, Treasury Department, Washington, D. C., on February 16, for furnishing and installing lighting fixtures in the United States post office at Aurora, Nebr., the United States post office at Charles City, Iowa, the United States post office and courthouse at Charlotte, N. C., the United States post office at Falls City, Nebr., the United States post office at Hackensack, N. J., the United States post office at Hornell, N. Y., the United States post office and courthouse at Opelika, Ala., the United States post office at Seymour, Conn., the United States post office at Shelby, N. C., the United States post office at Taylorville, Ill., the United States post office at Titusville, Pa., and the United States post office at Waynesville, N. C., in accordance with drawings and specifications, copies of which may be had at the above office.

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

	Div. Rate Per Cent	Bid Jan. 29	Bid Feb. 5
Public Utilities—			
Adirondack Electric Power of Glens Falls, common	....	27	26½
Adirondack Electric Power of Glens Falls, preferred	6	89	88
American Gas & Electric of New York, common	10+extra	141	140
American Gas & Electric of New York, preferred	6	50	51
American Light & Traction of New York, common	....	371	364
American Light & Traction of New York, preferred	6	113	111
American Power & Light of New York, common	4	87	85
American Power & Light of New York, preferred	6	93	92½
American Public Utilities of Grand Rapids, common	....	39	39
American Public Utilities of Grand Rapids, preferred	6	71	70
American Telephone & Telegraph of New York	....	126¾	124
American Water Works & Elec. of New York, common	....	11½	14
American Water Works & Elec. of New York, particip	7	28	25
American Water Works & Elec. of New York, first preferred	....	73	70
Appalachian Power of Bluefield, common	....	7	7¼
Appalachian Power of Bluefield, preferred	7	40	39
Cities Service of New York, common	6	304	280
Cities Service of New York, preferred	6	94	89¾
Commonwealth Edison of Chicago	8	136	134
Comm. Power, Railway & Light of Jackson, common	4	59½	60
Comm. Power, Railway & Light of Jackson, preferred	6	82½	81½
Federal Light & Traction of New York, common	....	15	14
Federal Light & Traction of New York, preferred	....	55	54
Illinois Northern Utilities of Dixon	6	83	82
Middle West Utilities of Chicago, common	2+2 extra	63	61
Middle West Utilities of Chicago, preferred	6	82	79
Northern States Power of Chicago, common	7	106	103
Northern States Power of Chicago, preferred	7	99	98
Pacific Gas & Electric of San Francisco, common	5	67½	64½
Pacific Gas & Electric of San Francisco, preferred	6	94½	92
Public Service of Northern Illinois, Chicago, common	7	111	108
Public Service of Northern Illinois, Chicago, preferred	6	100½	100
Republic Railway & Light of Youngstown, common	4	49½	47
Republic Railway & Light of Youngstown, preferred	6	75	73
Standard Gas & Electric of Chicago, common	....	14	13½
Standard Gas & Electric of Chicago, preferred	6	41½	39
Tennessee Railway, Light & Power of Chattanooga, common	....	9½	9
Tennessee Railway, Light & Power of Chattanooga, preferred	6	43	42
United Light & Railways of Grand Rapids, common	4	49	46
United Light & Railways of Grand Rapids, preferred	6	77½	76
Western Power of San Francisco, common	....	19	17
Western Power of San Francisco, preferred	6	67	67
Western Union Telegraph of New York	5+extra	98½	†94
Industrials—			
Electric Storage Battery of Philadelphia, common	4	66	†63
General Electric of Schenectady	8	171	†163
National Carbon of Cleveland, common	8	†300	†300
National Carbon of Cleveland, preferred	7	†130½	†130¼
Westinghouse Electric & Mfg. of Pittsburgh, common	5+extra	53½	†49
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	70	69

† Last Sale.

Financial Notes

The New Jersey Power & Light Company reports gross earnings for the year ending November 30, 1916, of $189,737, an increase of $32,683 over 1915.

The West End Street Railway has sold to Curtis & Sanger, F. S. Moseley and Blogett & Company, Boston, $2,700,000 five-per-cent five-year bonds callable in August, 1919, at 102 and interest.

The Standard Underground Cable Company, Pittsburgh, Pa., has authorized an increase in its capital stock from $3,500,000 to $10,000,000. Directors have also voted a stock dividend of 50 per cent, equal to $1,750,000 par value. A dividend of $11 per share was recently declared.

The Western States Gas & Electric Company, a subsidiary of Standard Gas & Electric Company, has applied to the California Railroad Commission for authority to create a new ten-year note issue for $5,000,000 and to sell $1,564,000 of the issue for the purpose of paying existing indebtedness and to pay for $300,000 of construction during 1917.

Bioren & Company and Newberger, Henderson & Loeb, Philadelphia, announce that they have purchased $1,750,000 new five-per-cent collateral trust bonds of the American Railways Company, issued for the purpose of retiring part of the $2,500,000 Scranton Railway gold trust certificates. Holders of the certificates may deposit same and receive in exchange for each maturing bond an interim certificate for one of the new bonds of the American Railways Company and $50 in cash, together with $25, the amount of the April 1 coupon.

Gross earnings of the California-Oregon Power Company during 1916 were $421,885.87 and its net earnings $212,426.73, according to the annual report made at a meeting of the board of directors. Report was made that the installation of the first unit of the new plant at Copco on the Klamath River will be completed next summer, adding 12,000 horsepower to the company's generating capacity. The sale of half of this will enable the company to resume payment of interest coupons which bondholders have waived for the present. At the annual meeting of the company yesterday directors and officers were re-elected.

The Lehigh Valley Transit Company reports the best year in its history during 1916. In this period the power sales totaled $504,000, an increase of $96,000 or 24.2 per cent over the preceding twelve months. The revenue from transportation increased from $318,000 to $1,967,508. The total operating revenue shows an increase of $415,000, or 20.1 per cent for the year. The net income increased to $468,476, a gain of $145,089, or 44 per cent, while the surplus increased from $344,295 to $560,200, a gain of 62.7 per cent. Dividends of $248,983, equivalent to five per cent on the preferred stock, were paid quarterly. The company's assets aggregate $20,735,949, with chief classification of properties, road and equipment, $17,817,633, and investment in affiliated companies, $1,896,437.

The Ohio Valley Electric Railway Company has sold to the Fidelity Trust Company of Baltimore, $800,000 first-mortgage five-per-cent 30-year bonds. The bonds are guaranteed principal and interest by the American Railways Company and there are $1,675,000 of them outstanding, the proceeds having been used to retire all underlying bonds. The company operates the electric railway systems of Huntington and Kenova, W. Va., Ashland and Catettsburgh, Ky., and Ironton, Ohio, with 46 miles of line and serving a population of 100,000. Earnings of the company for 1916 were $547,000 gross and $229,600 net.

BROOKLYN RAPID TRANSIT.

Brooklyn Rapid Transit Company's income report for the six months ended December 31, 1916, compares as follows:

June 30 to Dec. 31:	1916	1915
Gross	$14,880,669	$14,048,444
Expenses	8,296,634	7,716,609
Net	6,584,035	6,331,835
Taxes	1,246,925	855,718
Net	5,337,110	5,476,116
Other income	231,652	237,184
Total income	5,568,763	5,713,300
Charges	2,813,078	2,371,766
Surplus	2,755,684	3,341,533

The increase in operating expenses is due principally to the advance in wages; and the increase in charges is due to the additional rapid transit lines placed in operation.

Incorporations

NEW YORK, N. Y.—Crown Electric Illuminating Company. Capital $5,000. Incorporators: David Swartz and Samuel Swartz, 78 E. Houston Street, New York City; Wm. Schlesinger, 280 Bowery, New York City.

ALBANY, N. Y.—Schoharie Valley Light & Power Company. Capital, $100,000. To manufacture electric energy for light, heat and power. Incorporators: B. and E. C. Grantier, Esperance; and F. M. Landers, Duanesberg.

NEW YORK, N. Y.—Astra Electric Novelty Works. Capital $5,000. Incorporators: Bernard Seidman, 127 Powell Street, Brooklyn, N. Y.; Anna K. Ott, 518 West 161st Street, New York City, and David Finkelstein, 1167 38th Street, Brooklyn, N. Y.

NEWARK, N. J.—The New Jersey Electric & Auto Supply Company. Capital, $25,000. To manufacture electrical supplies for automobiles. Incorporators: Jerome J. Rafferty, National State Bank Building; H. L. and M. B. Doolittle.

NEW YORK, N. Y.—Morrow Insulating Company. Manufacturing insulating material, electrical supplies, etc. Capital $25,000. Incorporators: John J. Morrow and Clara Morrow, both of 674 Academy Street, New York City, and H. M. Lewis, 2055 Washington Avenue, Bronx, N. Y.

BROOKLYN, N. Y.—Ro-Co Battery Company. Manufacturers of all kinds of batteries and auto supplies. Capital $1,500. Incorporators: Marie J. Cox, 441 Second Street, Brooklyn, N. Y.; Wm. G. H. Kilpatrick, 154 Nassau Street, New York City, and David Morris, 26 Oliver Street, New York City.

PHILADELPHIA, PA.—The National Utilities Company has been incorporated under Delaware laws with a capital stock of $10,000,000, to acquire and operate the National Properties Company, the National Gas, Electric Light & Power Company, and the Jersey Central Traction Company. These companies furnish electric light and power to about fifty cities and towns, and gas to eleven cities, with the operation of over 600 miles of electric traction lines. Van Horn Ely, president of the National Properties Company, will be head of the new company.

Electrical Patents Issued January 30, 1917

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,213,815. Control System for Railway Air Compressors. C. J. Axtell, assignor to General Electric Co., Schenectady, N. Y. Electrical control system for air apparatus of a train.

1,213,818. Composite Armature Sleeve. W. J. Bauroth, assignor to Jeffrey Mfg. Co., Columbus, O. Structure for core support.

1,213,835. Reverse-Current Relay. G. A. Burnham, assignor to General Electric Co. Arrangement of switch and differential controlling coils.

1,213,837. Signal Device for Telephone Systems. A. E. Case, Chicago, Ill. A mechanical vibrator acts electromagnetically in the line.

1,213,844. Protective Device. E. E. F. Creighton, assignor to General Electric Co. Structure of lightning arrester.

1,213,845. Illuminated Switch and Indicator. R. W. Davenport, assignor to Detroit Stove Works, Detroit, Mich. For an electric cooking range.

1,213,865. Bridge for Supporting Electric Fixtures. J. R. Gunn, Detroit, Mich. Structure of bridge and ceiling outlet box. (See cut.)

1,213,871. Bipolar Electrode Electrolyzer. G. G. Hepburn, Manchester, England. Arrangement of tanks, electrodes and circulation of electrolyte.

1,213,872. System of X-Ray Tube Operation. G. R. Hogan and H. P. MacLagan, Chicago, Ill. A symmetrical wave form of electromotive force is supplied to the tube in amount greater than that required to cause current to flow from the anode to the cathode, and less than that required to cause current to flow from the cathode to the anode.

1,213,881. Sheathed Wire and Terminal Therefor. W. K. Kearsley, assignor to General Electric Co. Method of making a resistance element for electric heaters.

1,213,883. Synchronous Phonograph and Kinetograph. I. Kitsee, assignor to Cort-Kitsee Co., New York, N. Y. Combination of a sound machine, a pneumatic engine and a picture machine.

1,213,890. Trolley Harp. E. A. Leonard, Aurora, Ill. Special structure of bearings for trolley wheel.

1,213,891. Electrically Operated and Mechanically Controlled Train-Stopping Device. W. B. Murray, assignor to Miller Train Control Corporation, Staunton, Va. Lamp-operated plunger operates switch in train circuit.

1,213,892. Train-Control System. W. B. Murray, assignor to Miller Train Control Corporation. Structural details of apparatus employed in the above.

1,213,933. Electric Switch. H. J. Morey, assignor to Pass & Seymour, Solvay, N. Y. Details of cam-operated, rotary, multiple-contact switch.

1,213,937. Electric Circuit-Breaker. S. F. Nielssen, Houston, Tex. A time-limit device having a solenoid plunger operating against a regulatable air cushion.

1,213,960. Locking Switch. E. O. Sessions, Chicago, Ill. Latches for knife-blade disconnecting switch.

1,213,963. Recorder for Systems of Electrical Distribution. H. S. Sines, assignor to Minerallac Electric Co., Chicago, Ill. Records the beginnings, cessations and durations of currents.

1,213,968. Electrical Control for Paper Making Machines. C. Stickle, Indianapolis, Ind. Tension of web passing over drying cylinder electrically controls heating means.

1,213,974 and 1,213,975. Projection Apparatus. J. B. Taylor, assignor to General Electric Co. Comprises special formation of lamp filaments and arrangement of reflectors. Second patent: Structure of lamp for use with same.

1,213,981. Toaster. F. A. Vollbrecht, assignor to Industrial Electric Mfg. Co., Detroit, Mich. Structural details of electrical device.

1,214,005. Method of Bonding Rails and Like Conductors. J. R. Brown, assignor to Ohio Brass Co., Mansfield, O. The bonds pass under the splice plates and about the ends of the rails, and have their terminals welded.

1,214,011. Scale. S. G. Crane, assignor to Toledo Scale Co., Jersey City, N. J. Automatic weighing and indicating scale has a pendulum controlling contacts by magnetic attraction to avoid mechanical engagement.

1,214,014 and 1,214,015. Magneto. R. C. Danly, Chicago, Ill. Structural details of device having an oscillatory armature.

1,214,021. Light or Voltage Regulators. D. A. Eaken, Lodi, O. For automobiles. Resistance in circuit with lamps and magneto is controlled by centrifugal governor.

1,214,022. Apparatus for Wireless Telegraphy and the Like. P. E. Edelman, Minneapolis, Minn. The transmitter has means for modifying the wave length and audible frequency, while the receiver selects and renders intelligible energy received from the transmitter, by means of a rotating tuning member.

1,214,029. Maximum-Demand Indicating Instrument. C. I. Hall, assignor to Chicago Electric Meter Co., Chicago, Ill. Details of device for indicating the maximum consumption of electricity during one of recurring time intervals.

1,214,031. Reel. A. Heim, Liberty, Ind. For cord of an extension light.

1,214,048. Mechanical Interlock for Engine Self-Starters. A. L. McMurtry, Sound Beach, Conn. Switch connects with magneto or battery according to the position of the control lever for the self-starter.

1,214,053. Incubator. B. W. Mendenhall, Lake City, Utah. Arrangement of electric heater.

1,214,058. Vehicle Direction Indicator. W. B. Moulton and E. W. Moulton, Riverside, Cal. Electromagnetically operated.

1,214,067. Dynamoelectric Machine. W. H. Powell, assignor to Allis-Chamlers Mfg. Co., Milwaukee, Wis. Structure of brush rod support.

1,214,074. Time-Limit Relay Switch. C. Renshaw, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Structural details of switch.

1,214,077. Electric Switch. J. Sachs, Hartford, Conn. Cover of box containing switch is controlled by actuator.

1,214,078. Meter-Testing Appliance. J. Sachs. Connection block adapted to serve for load switching or meter testing.

1,214,079. Convertible Cutout Switch. J. Sachs. Load-switching element and its complemental contacts. (See cut.)

1,214,081. Centrifugal Switch. H. M. Scheibe, assignor to Westinghouse Electric & Mfg. Co. For mounting on the rotor of electrical machines.

1,214,083. Oil Circuit Breaker. H. R. Schultz, assignor to Westinghouse Electric & Mfg. Co. Structure of terminal member.

1,214,088. Speed Counter. C. E. Skinner, assignor to Westinghouse Electric & Mfg. Co. Driving connection is established during a predetermined interval by means of clock-governed electromagnet devices.

1,214,096. Movable Element for Electrical Measuring Instruments. S. Trood, assignor to Westinghouse Electric & Mfg. Co. Manner of mounting armature and damping disk upon shaft of meter.

1,214,099. Trolley Ear. E. Waldron, Schenectady, N. Y. Comprises interchangeable gears for gripping figure "8" trolley wires, and a suspending wire loop.

1,214,101. Hot-Wire Alternating-Current Limiter. P. Wessel, Ljan, Norway. Causes periodical interruptions of the current when the limit is exceeded.

1,214,116. Rectifier System. A. L. Atherton, assignor to Westinghouse Electric & Mfg. Co. Combinations of transformers and circuits with mercury-vapor device.

1,214,129. Electrical Protective Device. H. W. Brown, assignor to Westinghouse Electric & Mfg. Co. Temperature-responsive relay, comprising Wheatstone bridge arrangement.

1,214,141. Testing Apparatus. A. H. Daus, Chicago, Ill. For testing the insulation between a conductor and a metal member adjacent thereto.

1,214,143. Dynamoelectric Machine. G. M. Eaton, assignor to Westinghouse Electric & Mfg. Co. Manner of mounting bearings in frames of railway motors.

1,214,163. Electric Fan. W. C. Hood, Chicago, Ill. Arrangement of deflector plate in rear of fan.

1,214,183. Electrical Connecting Device. F. Kratz, assignor to firm of Robert Bosch, Stuttgart, Germany. Plug and socket contraction.

1,214,186. Soldering Iron. R. Kuhn, Detroit, Mich. Arrangement of heating unit.

1,214,198. Electric Fan. W. M. McEwen, Chicago, Ill., assignor of one-third each to G. Olson and L. Greenberg. Fan and motor mechanism are tilted vertically so that gyratory forces are set up, which cause horizontal oscillations.

1,214,199. Air-Circulating Device. W. M. McEwen, Chicago, Ill. Modification of the above.

1,214,208. Signal for Moving-Picture Reels. H. L. Miller, Pittsburgh, Pa. Contact device controlled by the amount of film on the reel.

1,214,210. Storage-Battery Plate. H. S. Mills, Astoria, N. Y. Grid for pasted type of plate.

1,214,214. Generator of High-Frequency Currents. P. O. Pedersen and V. Poulsen, assignor to Federal Telegraph Co. For wireless systems. Arrangement of generators and oscillation circuits.

1,214,235. Transformer Secondary. H. L. Smith, Westerly, R. I. Two-part structure for electric welding machines.

1,214,258. Telephone System for Toll Traffic. C. R. H. Arntzenlous, The Hague, Netherlands. For handling toll traffic in one direction.

1,214,265. Detector for Wireless Systems. M. Berel and L. Funke, New York, N. Y. Structure of device comprising an active crystal contacting with conductor.

1,214,271. Process of Plating. L. W. Bugbee, assignor to American Optical Co., Southbridge, Mass. Relates to the electroplating of aluminum.

1,214,280. Electrical System of Distribution. G. Crosby, assignor to Gould Coupler Co., New York, N. Y. Car-lighting system; variable speed generator has its voltage regulated by a carbon pile in its field circuit.

1,214,283. Wireless Telegraphy. L. de Forest, assignor to Federal Telegraph Co. Structure and arrangement of antenna.

1,214,309. Headlight. E. L. Jillson and W. R. Jillson, assignors to R. C. Colman, New York, N. Y. Arrangement of main and supplemental lamps and reflector.

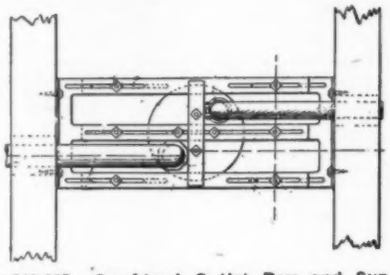
1,214,323. Controller for Heating Systems. F. T. Kitchen, assignor to Gold Car Heating & Lighting Co., New York, N. Y. Relates to structure of thermostatically actuated automatic switch.

1,214,353. Conduit-Box Receptacle. H. J. Morey, Syracuse, N. Y. Receptacle comprises a pull switch, and is adapted to be connected to outlet box.

1,214,355. Motor-Control System. E. J. Murphy, assignor to General Electric Co. Resistance controlled by successively actuated electromagnetic switches.

1,214,358. Bank-Robber Trap. E. E. Nunn, Malvern, Ark. Arrangement of door-operating motors and electrically charged screen on the inner face of the door.

1,214,363. Lamp Box. A. G. Peters,



1,213,865.—Combined Outlet Box and Support for Fixtures.

Minneapolis, Minn. Manner of securing glass to front of projector formed integral with a sheet-metal vehicle body.

1,214,375. Signaling System. A. H. Rudd, Media, Pa., assignor to Position Light Co. In a light signal system, relay control of proceed and stop lighting circuits.

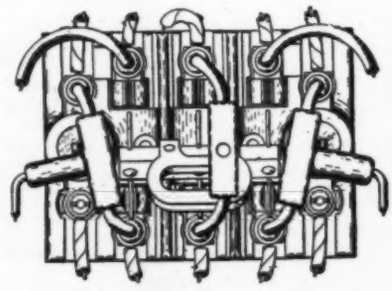
1,214,390. Sparking Plug. T. B. Towle, Dayton, O. High temperature is maintained at the sparking points by inclosing with a woven wire gauze.

1,214,401. Spark Plug. E. J. Willis, assignor of one-third to C. S. Wallace, Morehead City, N. C. Structure of device having a removable firing pin.

1,214,433. Cabinet for Electrical Appliances. E. M. Crane and C. R. Pelton, Detroit, Mich. Devices are automatically drawn into cabinet when their use is discontinued and the electrical connections are dependent upon whether the devices are within or without the cabinet.

1,214,439. Socket for Electric Lamps. L. P. Dixon, New York, N. Y. Double-ended structure with provision for lighting either or both ends as desired.

1,214,440. Electric-Trolley-Railway Signal System. B. M. Downs, Buffalo, and



1,214,079.—Convertible Cutout Switch.

W. S. Cook, Lackawanna, N. Y. Details of system applicable to single-track turnouts.

1,214,452. Lamp. G. W. Gillette, Cleveland, O. Adjustable support for lamp of projector.

1,214,459. Protector for Telephone Mouthpieces. M. G. Heberly, Springville, N. Y. Sanitary removable covering.

1,214,466. Register for Telephone Calls. E. T. Hull, New York, N. Y. Device in subscriber's station operates signal if call counter is not operated after a call has been made.

1,214,470. Terminal Clip for Electric Conductors. B. A. Jefferey, Detroit, Mich. Structural details.

1,214,471. Spark Plug. J. A. Jefferey and B. A. Jefferey, Newark, N. J. Details of construction.

1,214,472. Method of Manufacturing Spark Plugs. J. A. Jefferey and B. A. Jefferey, Detroit, Mich. Manner of manufacturing the above.

1,214,488. Electric Cooking Apparatus. W. D. Wright, San Diego, Cal. Structure of electric grill and waffle baker.

1,214,492. Telephone System. A. H. Dyson, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Arrangement of link circuits in automatic system.

PATENTS EXPIRED.

The following United States electrical patents expired on February 6, 1917:

642,570. Underground Electric Railway. W. J. Baumer and H. Emmel, Johnstown, Pa.

642,580. Apparatus for Producing Vacuum. F. J. F. Bruguiere, New Orleans, La.

642,599. Dynamoelectric Machine. H. Geisenhoner, Schenectady, N. Y.

642,615. Dynamoelectric Machine. C. W. Kragh, Madison, Wis.

642,623. Hanger for Electric Lamps. W. F. Murphy, Iowa City, La.

642,627. Electric-Lighting System. A. C. M. Prucker, Hanover, Germany.

642,648. Electric-Lighting Device. G. W. Van Duzer, Hackettstown, N. J.

642,662. Apparatus for Electrically Transmitting Orders or Signals. A. U. Alcock, London, England.

642,663. Means for Generating Ozone. C. G. Armstrong and W. D. Neel, Chicago, Ill.

642,674. Electrical Recording Apparatus, H. L. Calendar, Montreal, Canada.

642,697. Electrical Track for Receptacles, C. Hutchinson, Arlington, N. J.

642,737. Electric Railway. E. Bonnet, J. Paufique and G. Liniere, Lyons, France.

642,738. Electric Cable for High-Tension Currents. C. Borel, Lyons, France.

642,743. Commutator for Electric Motors or Generators. S. Evershed, London, England.

642,804. Electrically Igniting Lamps and Liquid-Fuel-Burning Devices. R. Schreiber, Berlin, Germany.

642,809. Telephone Switchboard. E. E. Yaxley, Chicago, Ill.

642,819. Apparatus for Producing Spectacular Effects. W. Freeze, New York, N. Y.

642,825. Socket for Incandescent Electric Lamps. W. E. A. M. Oetting, Pittsburgh, Pa.

642,826. Carbon for Electric Arc Lights. J. T. Robinson, New York, N. Y.

642,844. Push Button for Battery Indicators. G. Heidel, St. Louis, Mo.

642,848. Railway Signal Mechanism. S. L. Neely, Pierron, Ill.

642,849. Electrical Massage Instrument. E. T. Otto, Jersey City, N. J.

642,859. System of Electrical Distribution. H. P. White, Kalamazoo, Mich.

642,880. Connection Register for Telephone Lines. C. E. Scribner, Chicago, Ill.

642,881. Toll-Collecting Apparatus for Telephone Pay Stations. C. E. Scribner, Chicago, Ill.

642,911. Electric-Lamp Support. H. Long, Greentown, Ind.

642,913. Electric-Alarm Try Cock. S. M. Mathews, Toronto, Canada.

642,932. Electric Current - Controlling Mechanism. C. W. Squires and J. B. Squires, Springfield, Mass.

642,933. Electrolytic Separation of Zinc Oxide. O. J. Steinhart, J. L. F. Vogel and H. E. Fry, London, England.

642,934. Telephonic Instrument. F. A. Swan, Boston, Mass.

642,953. Electric Battery. H. Blumenberg, Jr., and F. C. Oberbury, New York, N. Y.

642,982. Mouthpiece for Telephone Transmitters, etc. G. B. Hart and F. W. Milligan, Rochester, N. Y.

642,995. Electric Connecting Device for Lamp Holders, Wall Plugs, etc. C. L. R. E. Menges, The Hague, Netherlands.

643,002. Electric Igniter for Explosive Engines. W. J. Perkins and C. H. Blomstrom, Grand Rapids, Mich.

643,012. Process of Producing Material Suitable for Electric Insulation or Other Purposes. A. Smith, London, England.

643,018. Utilization of Hertzian or Similar Radiations and Apparatus therefor. L. H. Walter, London, England.

643,066. Alternating-Current Motor. W. Langdon-Davies, London, England.

643,087. Electric Generator for Sparking Apparatus of Gas Engines. D. Drawbaugh, Eberly's Mills, Pa., assignor of three-fourths to D. B. Hoffer, Lebanon, J. E. Shettle, Shepherdstown and H. E. Eberly, Shiremanstown, Pa.

643,093. Electric Motor. J. C. Henry, Westfield, N. J.

643,005. Magneto-Electric Lighting Apparatus for Bicycles. S. Holdrege, Boston, Mass., assignor to the Dowd Electrical Company, New York, N. Y.

643,096. Process of Recovering Gold and Silver from Cyanide Solutions by Electrolysis. S. B. Christy, Berkeley, Cal.

Designs.

32,190. Binding and Contact Post for Knife Switches. H. T. Johnson, Jersey City, N. J.

32,203. Electric-Lamp Shade. G. W. de Tunzelmann, London, England.